the OIL AND GAS JOURNAL

DECEMBER 31, 1956

Annual International Oil Number

What's wrong with

Conservation in Oklahoma?

P. 86

A RESOLUTION THAT TURNED INTO A HABIT

The old saying, "New Years' Resolutions are only made to be broken", has never been accepted here at Halliburton. It never had a chance! First, because in all the years since Halliburton cemented its first well, we have held steadfastly to but one resolve...one purpose: to aid the recovery and production of oil...with optimum results at minimum costs...with maximum possible protection to untapped reserves...by providing intelligent, effective, integrated services to this end. That Halliburton remains dedicated exclusively to its primary purpose is proof enough that one good resolution...faithfully kept...stands the test of time...and competition. Second, because every year adds stature and strength to a firmly rooted...healthy...still growing *desire* to serve. Good resolutions...firmly guarded and kept...eventually become good habits. And *sincere* service is a habit we intend to keep...and continue to cultivate...to the benefit of every Halliburton customer and the Industry we are proud to serve.

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"PROGRESS IN SERVICE THROUGH RESEARCH"

A Glance Ahead . . . at press time

These Trends will make TOMORROW'S NEWS

Bacteria injection could be the next step toward stripping all the oil out of a reservoir—even after secondary-recovery methods have played out.

Field tests being conducted near Iola, Kans., should show whether the method will work. The actual mechanism by which the bacteria might be effective has not been shown, but postulates are: (1) the bulk of growing bacteria could force oil from solid surfaces; (2) the bacteria would release surfactants to make more oil removable; (3) acid produced by the bacteria would dissolve the calcareous material which is trapping the oil; and (4) carbon dioxide formed by the bacteria would lower oil viscosity, making the oil more mobile.

Emphasis on positive-volume meters is gaining as more producers become convinced of the advantages of making their production operations automatic. Tank manufacturers who foresee a big drop in tonnage of steel sold as storage tanks are planning to take up the slack with mass-produced automatic-measuring devices.

The tight money market, together with the shortage of pipe and anticipated increase in steel prices, may reduce major pipeline construction in 1957. One gas-transmission company is said to be taking another look at its proposed expansion program. Indications are that much of the program may be delayed until money and steel are easier to get.

Pipe-stress analysis looks like a big field for computer application. On a recent plant piping project a thorough study of design requirements resulted in a saving of $42,000. The numerous additional calculations made possible by using a computer revealed the pipe system had been overdesigned to this extent.

The Gulf Coast may become a center for upgrading low-value pentanes and hexanes into high-octane blending components for motor fuel. At least one major company has made plans to isomerize upwards of 12,000 bbl. daily. Charge stock will be obtained from a natural gasoline-L.P.G. stream which will be moved by pipeline from West Texas and fractionated at a terminal adjacent to large underground storage facilities.

The 1957 California legislature probably will pass three important oil bills. One will cover well spacing, another give Long Beach the power to unitize its tideland oil properties with those of private operators, and the other providing a broadened but mild, code to prevent underground waste. These will not have strong opposition, but any containing conservation provisions as broad as the recently defeated Proposition 4 will probably never reach the floor.

New enthusiasm for drilling in the Williston basin may result from Amerada's recent discovery in northeastern Sheridan County, Montana. The rank discovery is one of the basin's most important developments, both because of its location and its pay zone—the Silurian.

the OIL AND GAS JOURNAL

DECEMBER 31, 1956 • VOLUME 54 • NUMBER 87

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Type is being set now on the complete index covering all material printed in the Journal during 1956. The mailing list is being compiled, and the indexes will start moving to Journal readers in mid-January.

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WORLD-WIDE OIL REPORT

Summary of World Operations **105**

A country-by-country summary showing reserves, producing wells, drilling operations, production rates and totals, and totals, and refining capacities and processing operations.

Today's Shifting Tanker Situation **107**

By John J. Winterbottom

A look at the makeup of the present and projected tanker fleet and a forecast of possible future industry tonnage supply-demand situations.

International Oil Map **109**

A three-page foldout map, showing world-wide oil activities on one side and details of Venezuela, Mexico, and the Middle East on the other.

Prospective Oil Areas of the World **117**

World-Wide Oil Report, Country by Country **118**

Here in 46 pages of maps, tables, and text, the Journal gives you a report on the international oil picture today. Small index maps help to orient you on the area, and summary tables give important figures for each individual country.

International Oil Directory **157**

A list of companies operating outside the United States and Canada, with brief descriptions of their operations, and names of their principal officers.

Shell's Lake Maracaibo Operations **166**

The company has over 100 wells, with production of more than 140,000 bbl. per day. Operations are in 60 to 110 ft. of water, from permanent platforms.

Cambrian Seen as Australia's Bright Hope **173**

By W. D. Mott

While exploratory wells drilled in all parts of Australia in 1956 were unsuccessful geologists are studying the Cambrian as a likely oil reservoir.

Russia Expands Its Natural-Gas Industry **178**

By Henry F. Lippitt, II

Russia is now transporting 300 billion cubic feet of gas annually, but the 1956-1960 5-year plan calls for doubling gas pipeline mileage.

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The company is building a pipeline and other facilities for putting into production on April 1, 1957, Safaniya field. This is the first offshore pipeline to be developed in the Persian Gulf.

Europe's Largest Refinery Continues Expansion **188**

Shell's Pernis plant now has crude throughput of 220,000 bbl. per day. The Rotterdam plant also has large petrochemical output.

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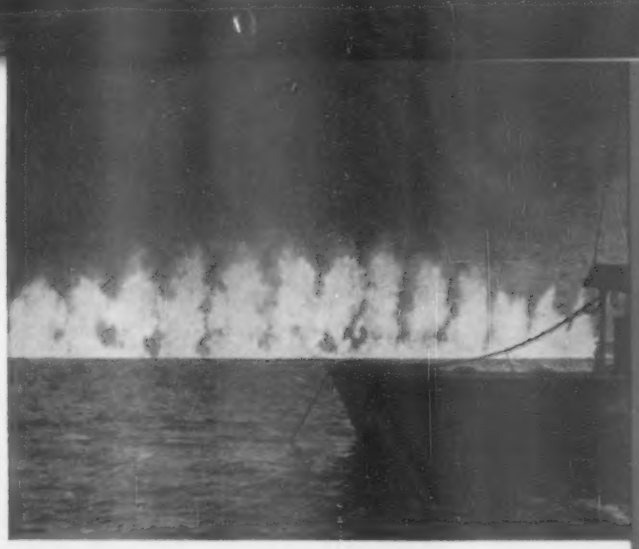

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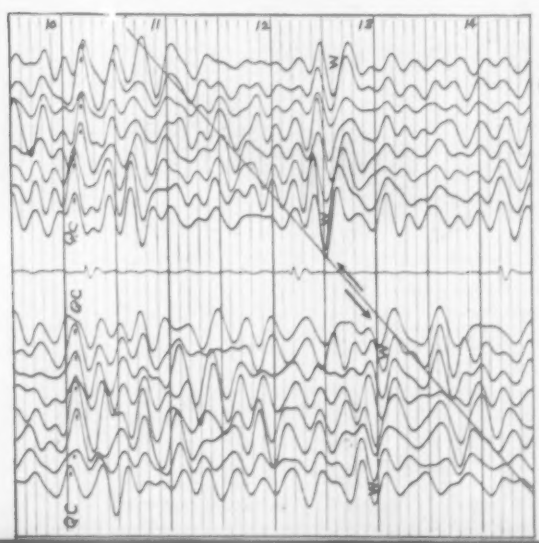

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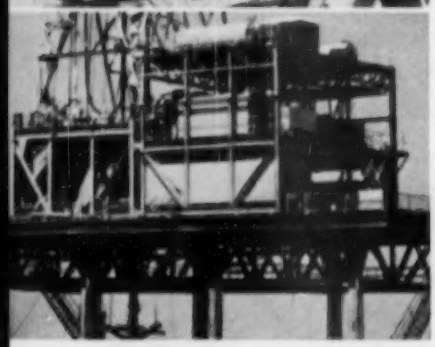

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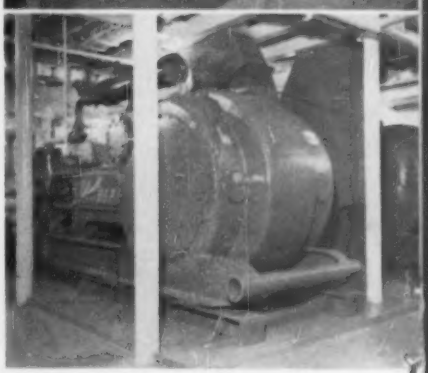

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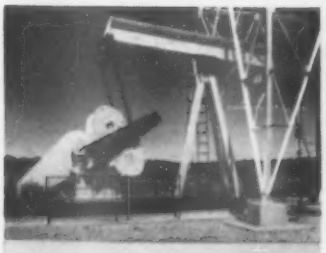

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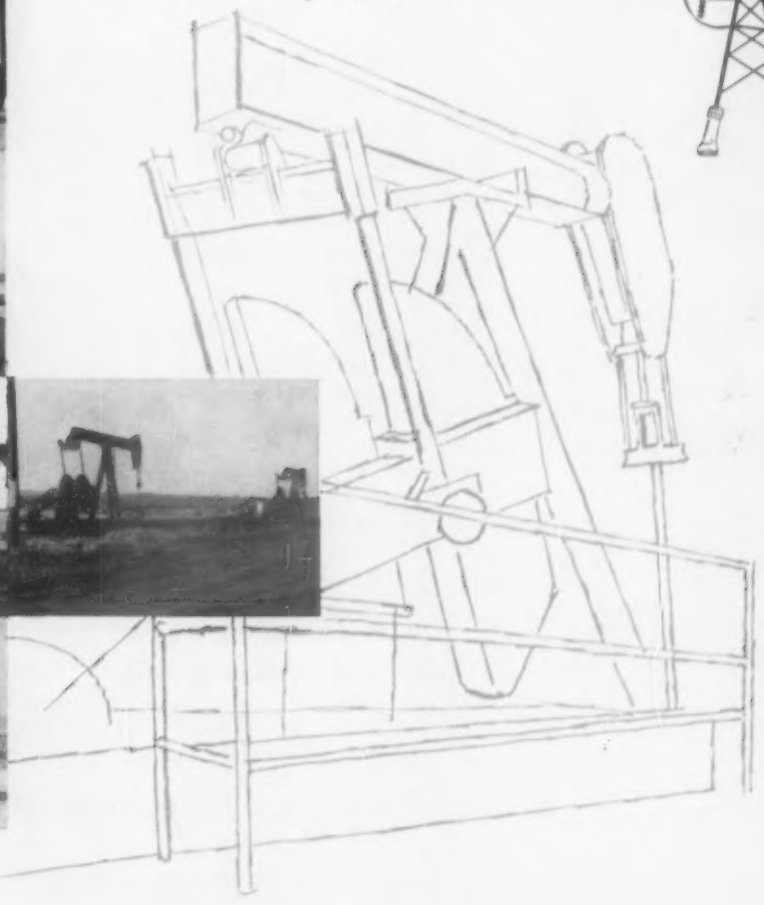

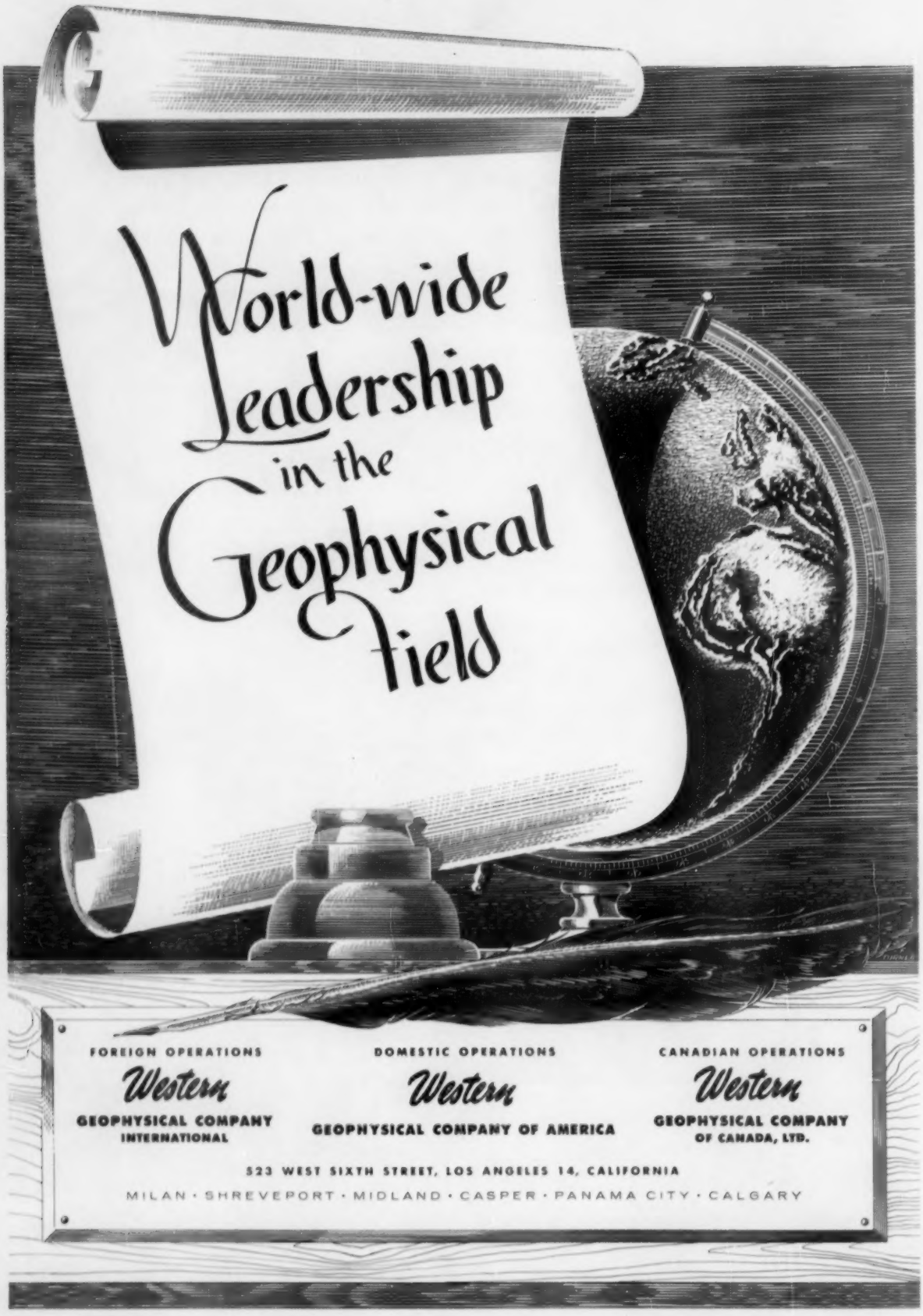
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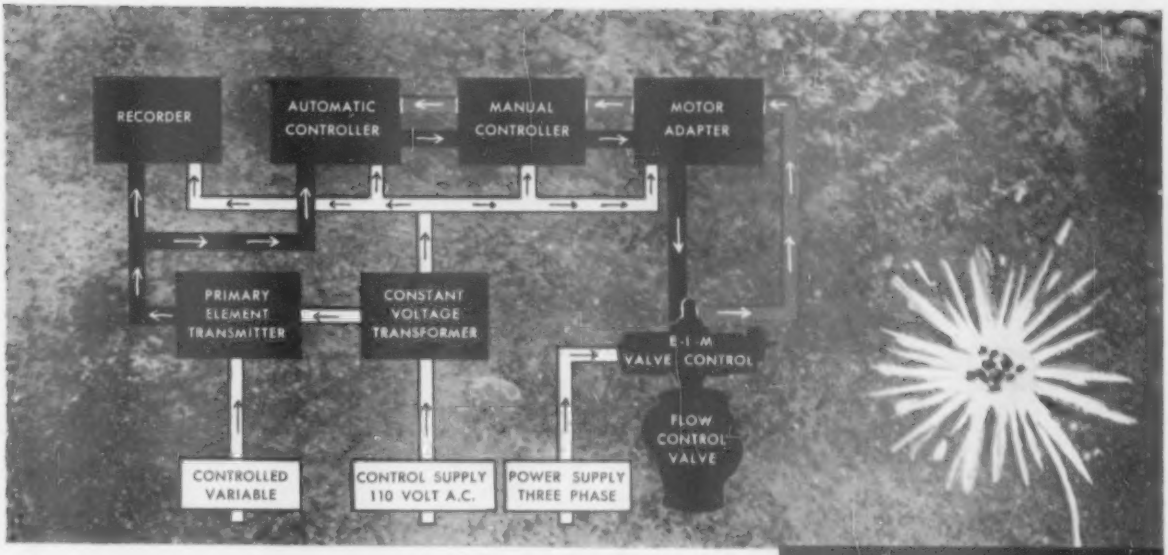

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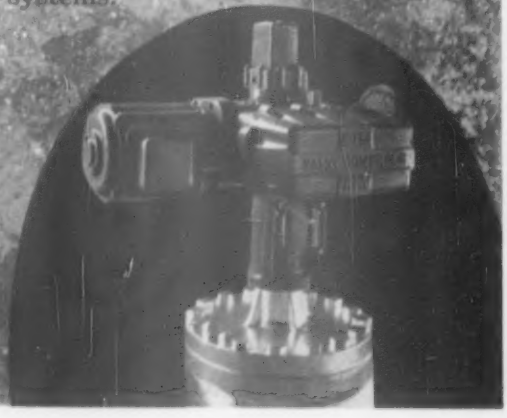

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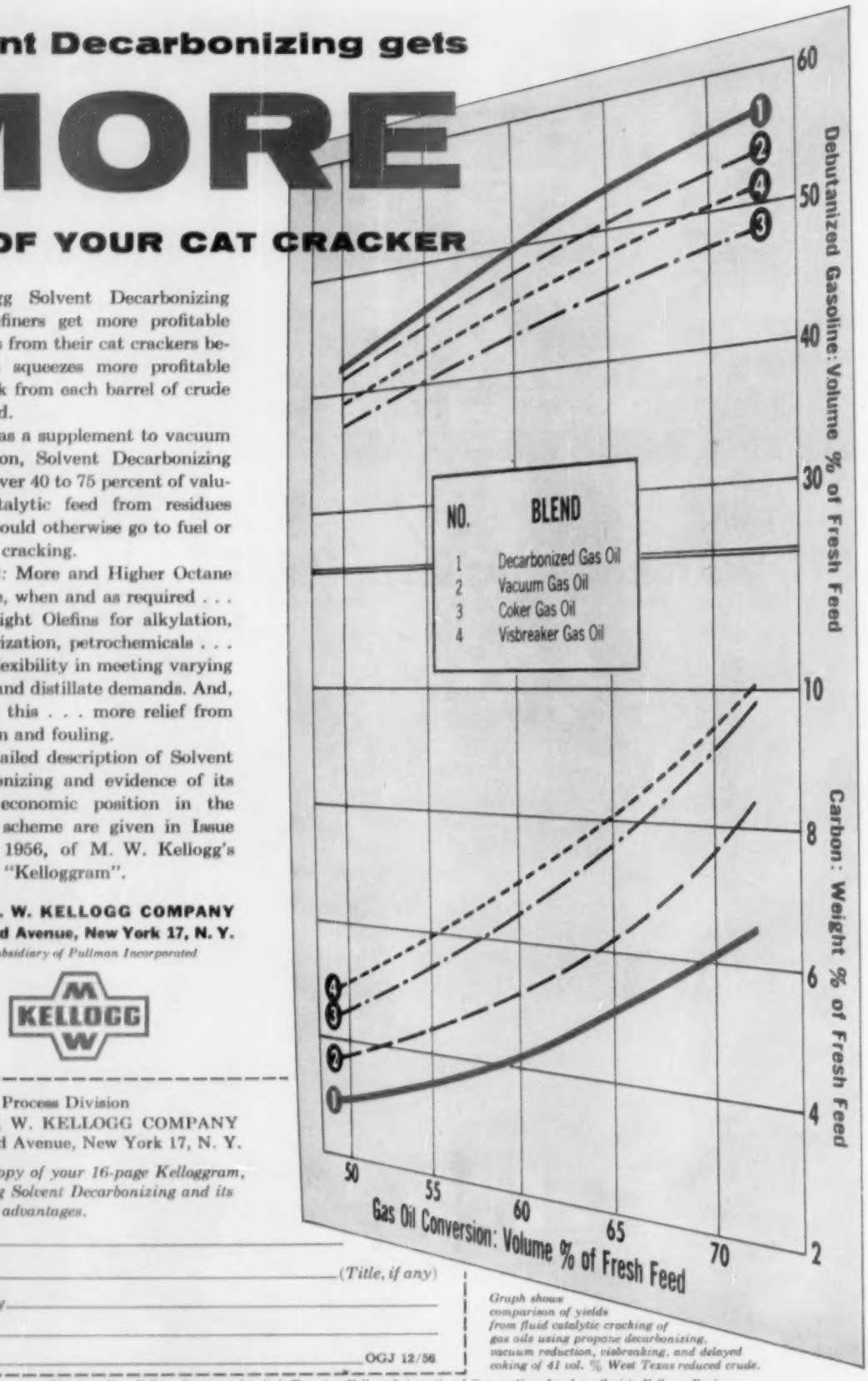

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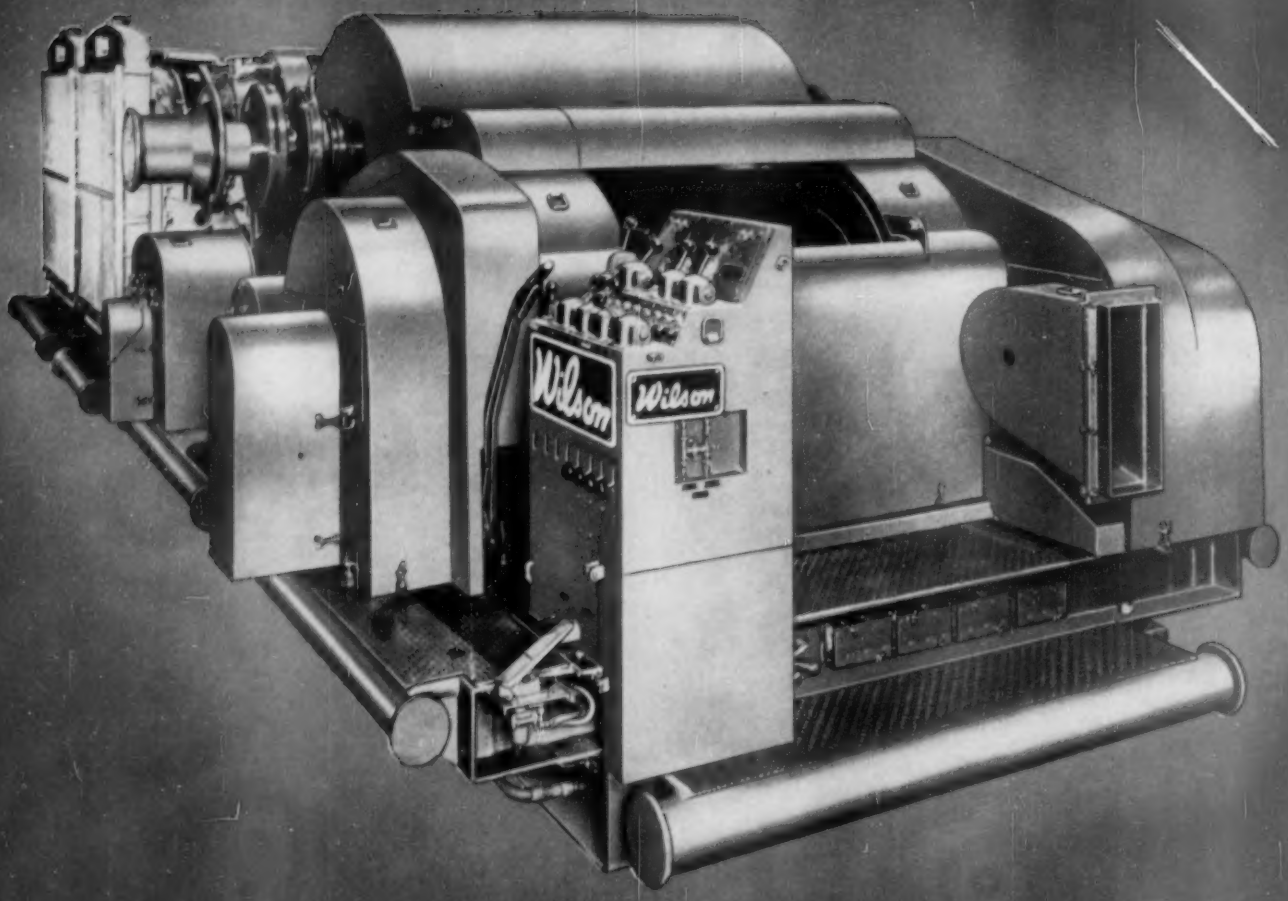

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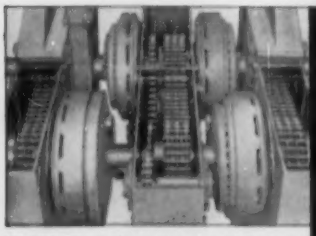

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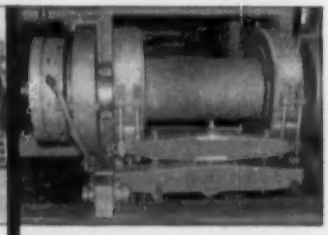

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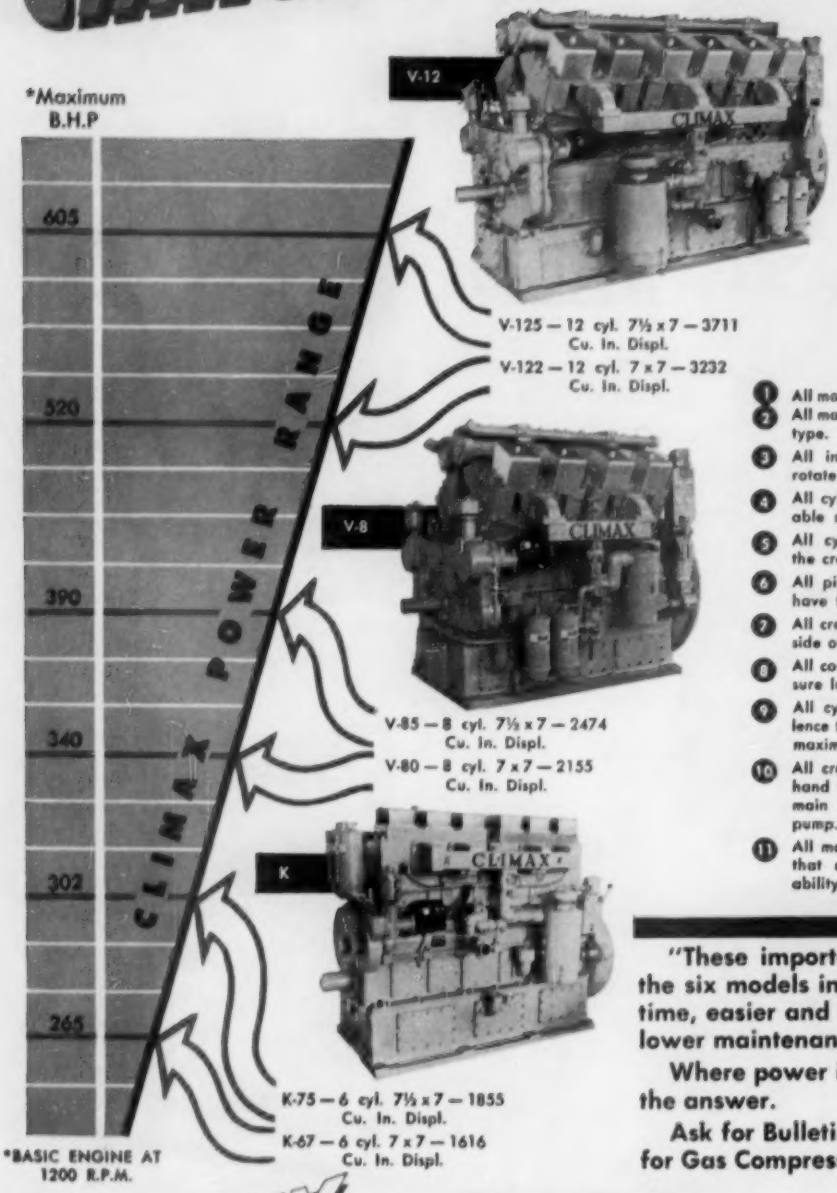
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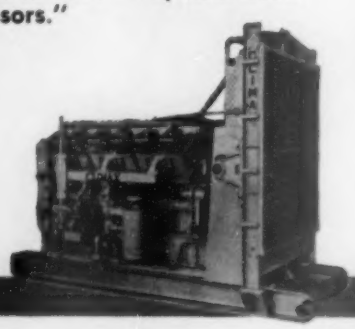

climax BLUE STREAK ENGINES

CLIMAX ENGINE AND PUMP MFG. CO.
208 SO. LA SALLE ST. CHICAGO 4, ILL.
FACTORY CLINTON, IOWA
DISTRICT OFFICE 155 CONTINENTAL AVE. DALLAS 7, TEXAS

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Drillers Machine Shop
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•

Cullander Machinery Co.
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•

Tobin Machinery Co.
Lafayette, La.

Vern Walton Co.
Coolidge, Casa Grande & Marana, Ariz.

•

Landes, Zachary and Peterson
Denver, Colo.
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•

United Power, Inc.
(Formerly United Tool Co.)
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RECTOR type "M"

..the Tubing Head that's WAY ahead

..in Flexibility

MANDREL HANGERS

Type "A" Mandrel Hanger threaded for EUE or regular tubing.

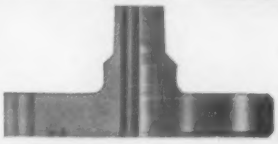
Type "M" Stripper for tubing heads with locking screws.

Type "A-O" Mandrel Hanger threaded, also grooved for locking screws. The "O" Ring serves as temporary seal.

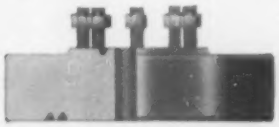
Type "WM" Wrap-Around Mandrel. It is hinged to wrap around tubing; also grooved for locking screws.

Type "C" "Slick Joint" Mandrel grooved for locking screws. The "O" Ring serves as temporary seal.

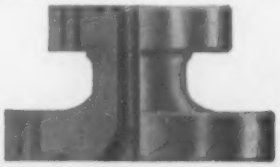
BONNETS



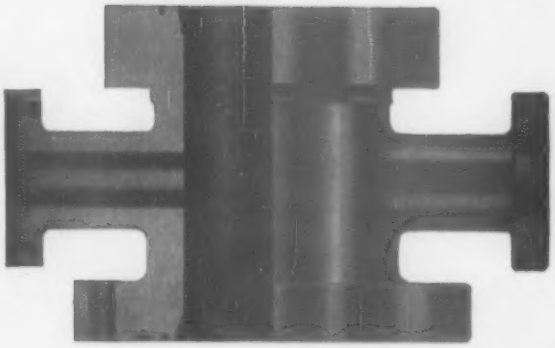
Male threaded bonnet also available with underside female threaded to hang tubing.



Studded bonnet also available with underside female threaded to hang tubing.



Spool-type bonnet also available with underside female threaded to hang tubing.



• **The wide range of body types (6), the complete range of pressures (2,000 to 15,000 lb. test), the variety of mandrel hangers and bonnets (10) . . . all of which are interchangeable in the bodies, plus auxiliary equipment, make it possible to select a Rector Type "M" Tubing Head for every well completion condition and preference.**

Every one of these heads employs the proven Rector principle of sealing with steel . . . a single API Ring Gasket acting dually as seal and hanger hold-down. There are no soft or resilient seals in these heads to deterioriate, burn out, freeze or contract in extremely low temperatures.

When planning well completions . . . specifying Christmas Trees . . . specify a Rector Type "M" Tubing Head for the utmost in safety and flexibility.

For complete specifications of all Type "M" Tubing Heads, Mandrels and Bonnets, see the Composite Catalog.

RECTOR WELL EQUIPMENT COMPANY

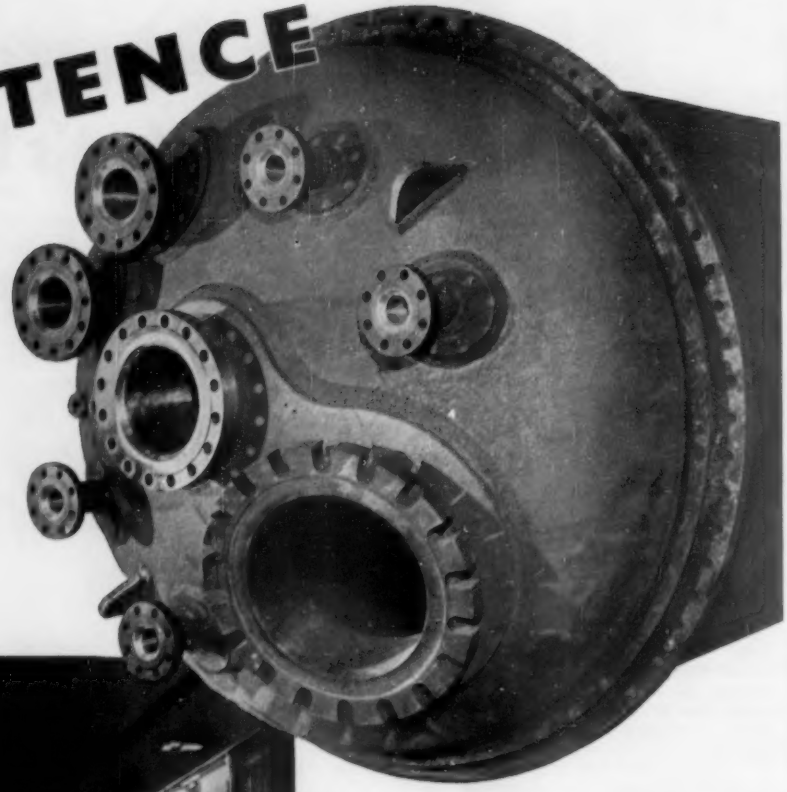
1100 NORTH COMMERCE ST., FORT WORTH, TEXAS

Houston Plant: 2215 Commerce St.

REPRESENTATIVES IN ALL ACTIVE FIELDS

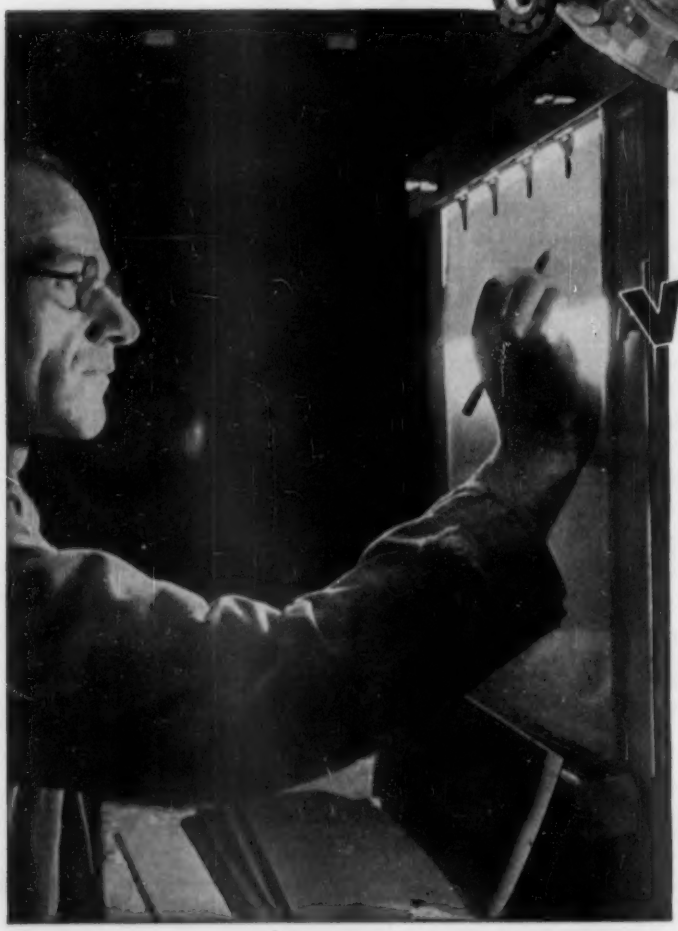
RECTORHEAD RECTORSEAL

COMPETENCE



Head of a 6 ft. dia. Autoclave spun on the Harvey "Rotarpress" from a stainless steel disc 1⅝ in. thick.

Designed for a working pressure of 500 lbs./sq. in.



VIGILANCE

KEYNOTES OF

Harvey

FABRICATION

G. A. HARVEY & CO. (LONDON) LTD., Woolwich Road, London, S.E.7. Cables: 'Cheaper, London.'

NOW!

A BRAND-NEW CONCEPT IN FLOW TOTALIZING!

. . . THE NEW FOXBORO PNEUMATIC FLYBALL INTEGRATOR

Inherently Accurate!

- Eliminates Inaccurate "Spot Check" Counting!
  Continuous integration assures highest precision.
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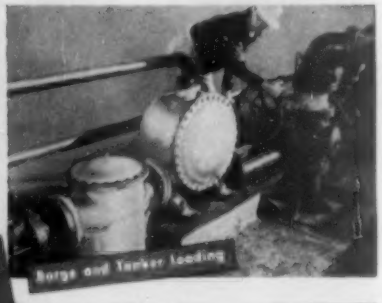
  Unique design balances differential pressure signal directly against centrifugal force.
- Eliminates Calculations!
  Automatically extracts square root — shows totals in desired units.
- Eliminates Fire and Explosion Hazards!
  Simple, all-pneumatic operation requires no electric motors, wires, or contacts.

FOXBORO
REG U.S. PAT. OFF.

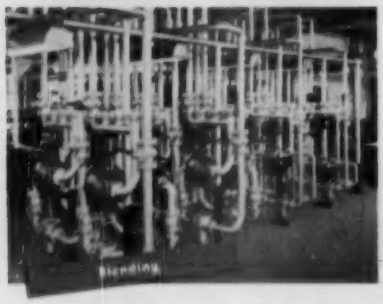
Now you can integrate the flow of all process fluids or plant services *continuously* . . . with new accuracy . . . complete safety! The unique new, all-pneumatic Foxboro Flyball Integrator completely eliminates intermittent counting and fire hazard. Its simple, force-balance operation utilizes the 3-15 psi air signal from any differential-pressure flow transmitter. This signal is *continuously* balanced against the "flyball" force of the instrument's pneumatically-driven turbine. The square root function is automatically extracted . . . you read flow totals *directly*.

The Flyball Integrator mounts at the point of measurement or on a panel hundreds of feet away. Response and accuracy are completely unaffected by ambient temperature changes or pressure changes in turbine air supply. Ideal solution to all plant fluids accounting and in-process inventory checking. Write for complete details. The Foxboro Company, 6012 Neponset Ave., Foxboro, Mass.

FIRST IN FLOW



Everywhere in Every Use —BRODIE BiRotor METERS



Extreme versatility of installation, high sustained accuracy and low maintenance have built Brodie BiRotor Meter acceptance in every field of petroleum measurement.

From the smallest job to the largest, there's a BiRotor built to handle the required capacity and pressure—with counters, controls, strainers and air eliminators to provide fully integrated systems.

Whatever your metering needs, check first on the exclusive advantages of Brodie BiRotors.

BRODIE BiRotor METERS

ALL-STEEL BiRotor TRUE ROTARY

RALPH N. BRODIE COMPANY · San Leandro, California, U.S.A.

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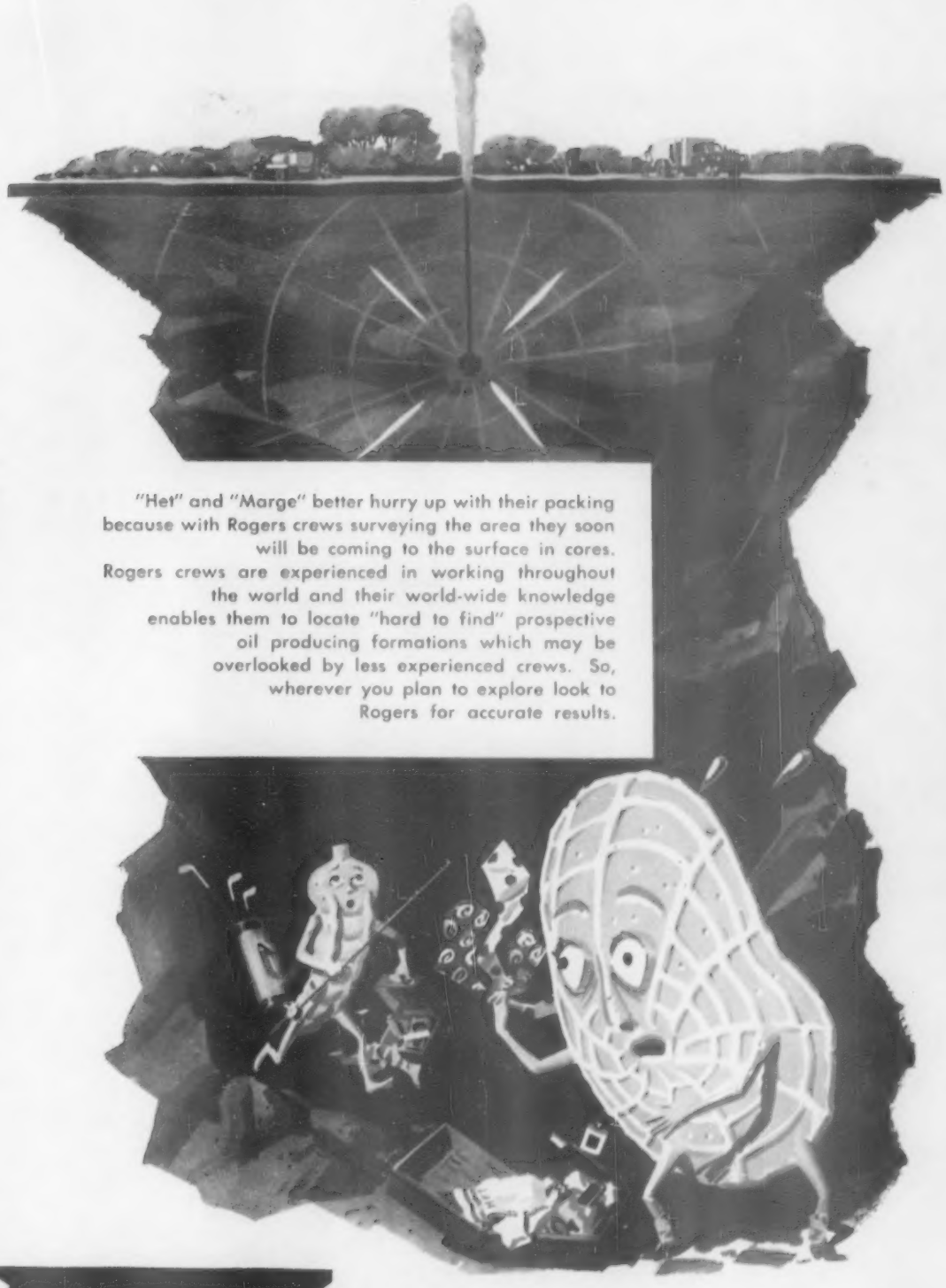
REPRESENTATIVES WITH STOCKS AND SERVICE FACILITIES IN ALL PRINCIPAL CITIES



"Hef" and "Marge" better hurry up with their packing because with Rogers crews surveying the area they soon will be coming to the surface in cores. Rogers crews are experienced in working throughout the world and their world-wide knowledge enables them to locate "hard to find" prospective oil producing formations which may be overlooked by less experienced crews. So, wherever you plan to explore look to Rogers for accurate results.

Rogers *Geophysical Company*

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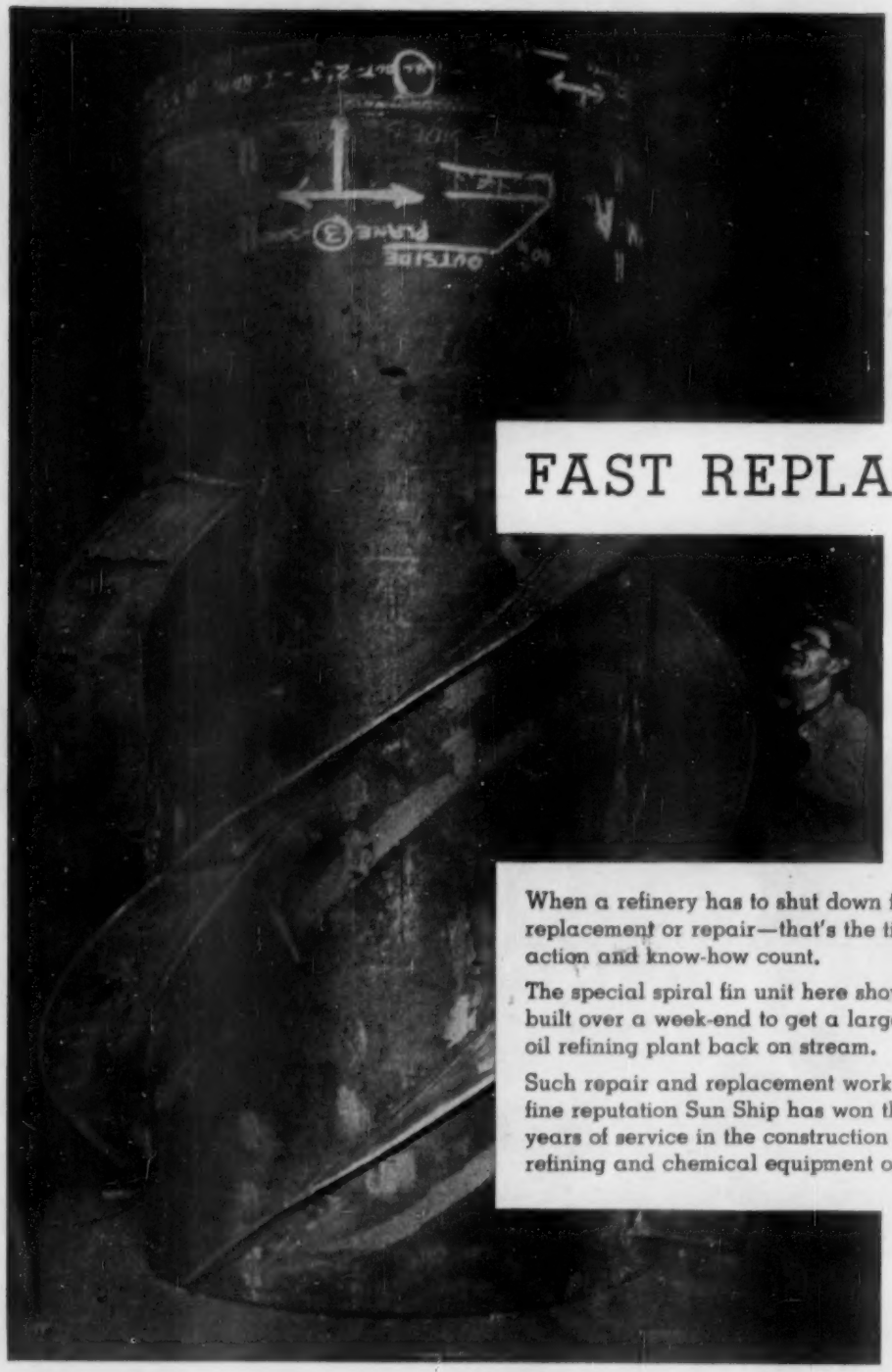
ROGERS CREWS GO EVERYWHERE



FAST REPLACEMENT

When a refinery has to shut down for a replacement or repair—that's the time when action and know-how count.

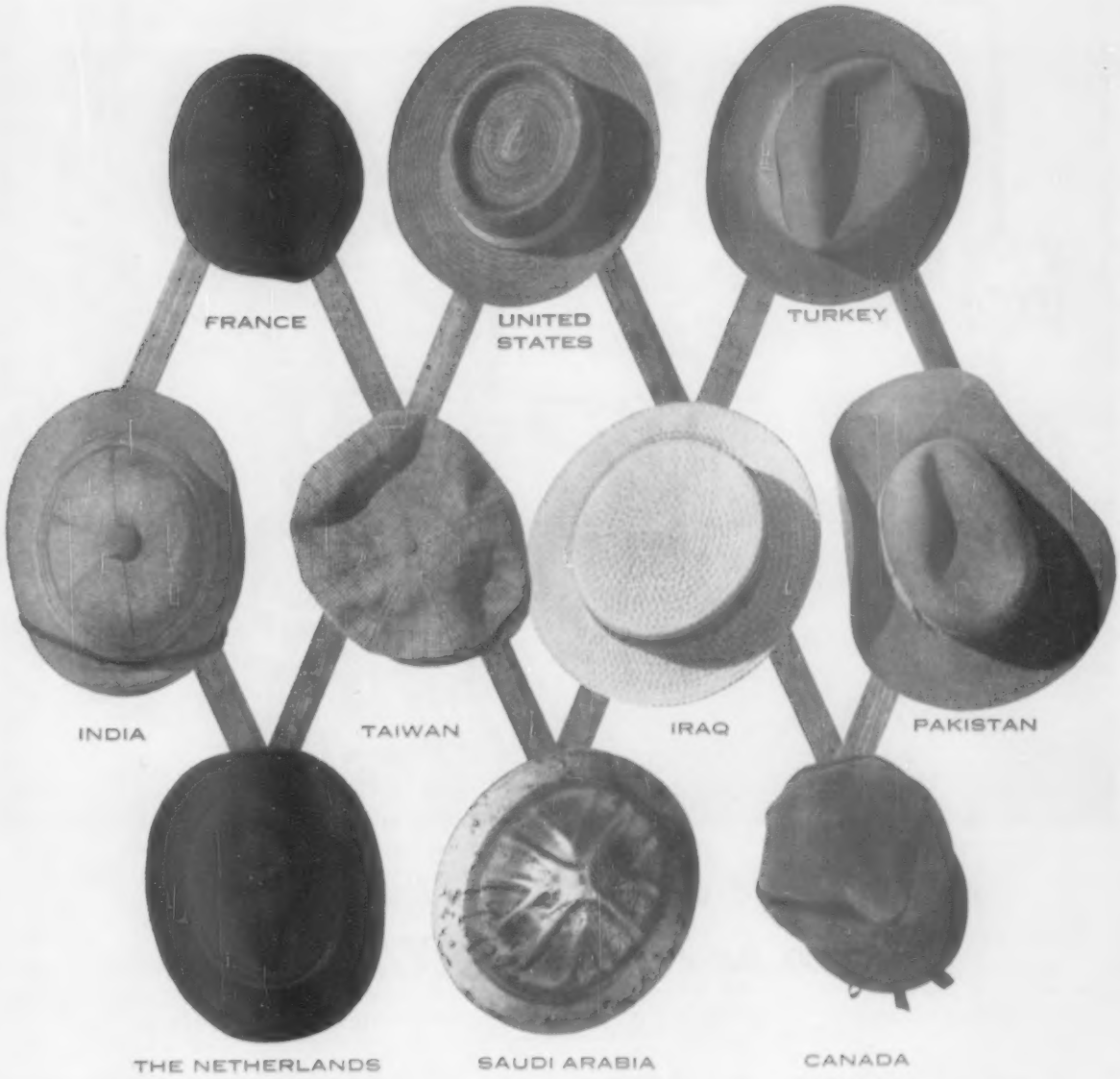
The special spiral fin unit here shown had to be built over a week-end to get a large oil refining plant back on stream.

Such repair and replacement work has added to the fine reputation Sun Ship has won through years of service in the construction of oil refining and chemical equipment of every kind.

Sun

SHIPBUILDING & DRY DOCK COMPANY

ON THE DELAWARE (SINCE 1916) CHESTER, PA.



WORLD-WIDE OPERATIONS by PARSONS

Parsons' men hang their hats in many places. Petroleum and Chemical engineers in the United States, The Netherlands, France, Canada, Turkey, Saudi Arabia... Water Development scientists and engineers in Latin America, India, Pakistan, Iraq, Iran, Taiwan... Construction crews, procurement specialists, and expediters in these and many other places—working on a wide range of projects, performing a variety of services, provide Parsons with the experience and know-how so essential in overseas operations.

THE RALPH M. PARSONS COMPANY

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ENGINEERS • CONSTRUCTORS
LOS ANGELES

ANKARA
BAGHDAD
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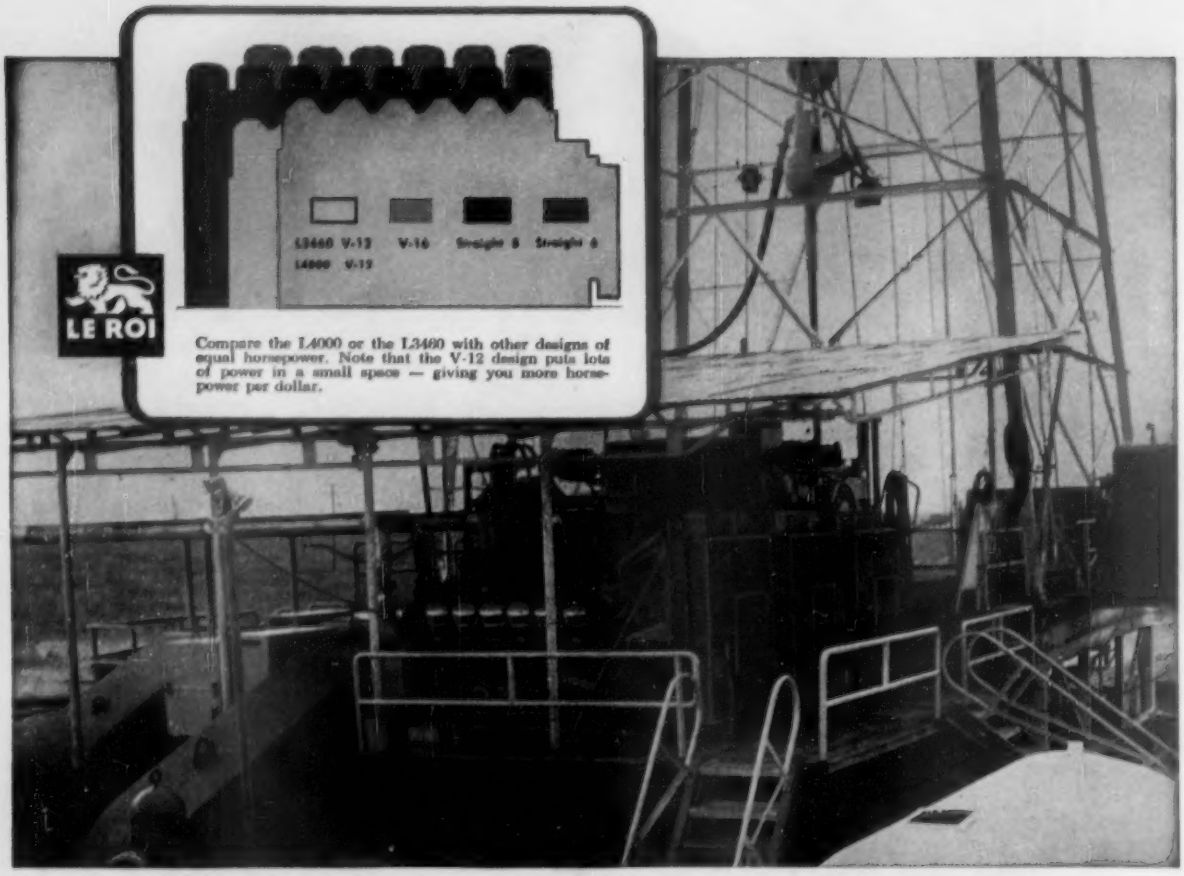
JEDDAH
KARACHI
NEW DELHI
PARIS



Compare the L4000 or the L3460 with other designs of equal horsepower. Note that the V-12 design puts lots of power in a small space — giving you more horsepower per dollar.

An engine doesn't have to be BIG to be POWERFUL!

The compact, V-12 design of Le Roi's L4000 and L3460 proves it!

Le Roi's L4000 and L3460 engines represent the first truly new design concept in 15 years. They are compact high-output engines, designed with short stroke to give you greater horsepower and speed without compromising engine life.

In addition to the advantages of short-stroke design, these modern V-12's have lightweight pistons, short-radius rotating parts — hydraulic tappets — crankshaft vibration dampener — sensitive controls. That's why they give you hair-trigger response to load demands.

The fuel economy of these engines is good, too. Thanks to advanced-design manifolding, low friction bearings, and low power loss to accessories, they give you rock-bottom fuel consumption.

Yes, big surprises come in small packages. That's especially true of the L4000 and L3460. These engines are conservatively rated to give you plenty of power in reserve. The L4000, for example, provides 655 max. hp. and the L3460, 600 max hp. And they have a wide speed range, too, up to 1350 rpm. That's why these engines are ideally suited to a great many oilfield applications: drilling, pipeline station, generator, gas booster, etc.

Engines may come bigger than these Le Roi's, but they sure don't come better! See for yourself — ask your supply house or Le Roi distributor to show you an L4000 or L3460 at work. Call him soon. Bulletins are also available — just write for them.

LE ROI *Division of Westinghouse Air Brake Co.*

Milwaukee 1, Wisconsin

LABORATORY ANSWERS PERTINENT QUESTIONS ABOUT NON-FLUORESCENT OIL IN EMULSION DRILLING FLUIDS.

No-Glo Oil* Assures Positive Recognition of Oil Zones Under Black Light.

by Doyne L. Wilson
Director of Research
Oil Base, Inc.

Geological interpretations have been the cause of many objections to using emulsion drilling fluids. Contamination of the cores or cuttings have often made it difficult to define with certainty the source of the show under Ultra Violet light.

We feel that you are entitled to all the answers about NO-GLO OIL and its uses, and hope that this information will prove to you that NO-GLO OIL merits a trial on your next job.

QUESTION . . . Is NO-GLO OIL truly non-fluorescent and stable under high temperatures?

ANSWER . . . Yes. It looks just like water under UV or conventional light, and is completely colorless. It is not subject to change under high temperature.

QUESTION . . . Why use a non-fluorescent oil in an emulsion drilling fluid?

ANSWER . . . It assures positive recognition of the oil zones by the fluorescence of their cuttings or core fragments under the UV light.

QUESTION . . . Can NO-GLO OIL be substituted for Diesel oil to achieve the *same* results?

ANSWER . . . NO-GLO OIL can be substituted, volume for volume, for Diesel oil and the resulting drilling fluid will have virtually the *same* physical characteristics and will be maintained in the *same* manner. In areas where the use of commercial emulsifiers are desirable, the same amount of this emulsifier for either oil will produce equivalent mud properties.

QUESTION . . . What are the objections to using Diesel oil or similar cuts?

ANSWER . . . Most Diesel, gas, stove or similar oils fluoresce very much like oils from condensate or distillate zones. They impart their fluorescence to the emulsion drilling fluids in which they are used, and hence to the formation. In deep hot holes they develop a fluorescence resembling that of many crudes.

QUESTION . . . Is NO-GLO OIL sufficiently field proven?

ANSWER . . . Yes, with excellent results in Louisiana, East, South and West Texas, Oklahoma, Wyoming, New Mexico, California, Venezuela, Colombia, Peru, and Trinidad.

QUESTION . . . Is there any difference between electrical logs obtained by using NO-GLO OIL as compared to Diesel or crude oil?

ANSWER . . . No. In all of our experience there is no known difference.

QUESTION . . . Are there any special precautions necessary in using non-fluorescent oil after it arrives at the rig site?

ANSWER . . . All tanks and lines for handling the oil should be free from any fluorescent materials. If this is not convenient, the oil may be directly introduced into the mud stream from the delivery truck or drums. Reasonable care should be exercised to minimize contamination by other oils or rig greases. A non-fluorescent thread lubricant is unnecessary if job is of short duration; however, for drilling jobs lasting over ten days, NO-GLO THREAD LUBRICANT should be used.

QUESTION . . . How much does NO-GLO OIL cost?

ANSWER . . . Only slightly more than Diesel oil in most areas, and it is available through distributors in practically every major producing area.

If you have not yet received your copy of our new 4-color Technical Bulletin on the fluorescent properties of Emulsion Drilling Muds—contact any OBI representative or write Oil Base, Inc., 130 Oris Street, Compton, California.

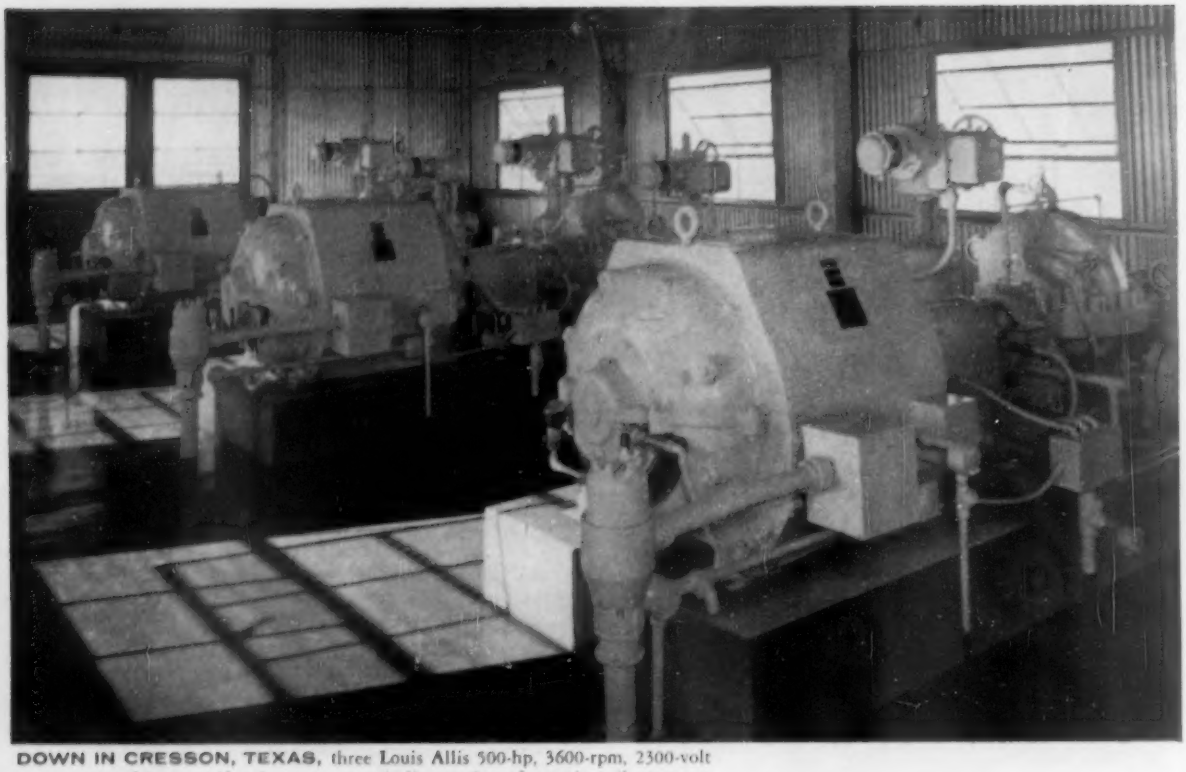
*NO-GLO OIL is Covered by U.S. and Foreign Patents. Licenses are available.

OIL BASE, INC.

PRODUCTS

Plants in: Houston • Odessa • Duncan • Compton

Branches in:
Houston • Odessa • Corpus Christi • Oklahoma City • Duncan • Lafayette • Harvey • Bakersfield • Long Beach • Ventura
Mexico City • Caracas • Lima • Bogota • Calgary • Paris. CABLE ADDRESS: OBI



DOWN IN CRESSON, TEXAS, three Louis Allis 500-hp, 3600-rpm, 2300-volt open motors drive centrifugal pumps at main-line station of a major oil company.

STATIONS STAY ON-STREAM

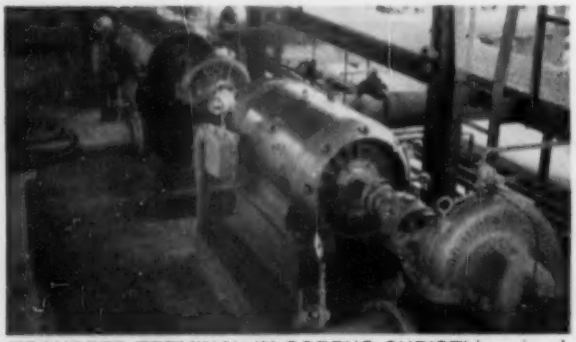
with Louis Allis Motors built to pipeline requirements

There is a Louis Allis Motor designed specifically for your pipeline job—one with long-life features that protect against costly downtime and maintenance

Where a Louis Allis standard motor doesn't fill the bill exactly, you can get prompt delivery on a unit specially designed to give you the electrical and mechanical characteristics best suited to your needs.

Contact your nearby Louis Allis Field Engineer—or write us—for a solution to your motor problem, based upon our more than 50 years' experience.

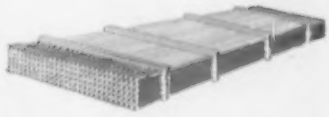
THE LOUIS ALLIS CO.
MILWAUKEE 7, WISCONSIN



TRANSFER TERMINAL IN CORPUS CHRISTI is equipped with three Louis Allis 200-hp, 3600-rpm, 440-volt motors.

THIS VERTICAL BOOSTER PUMP is driven by a Louis Allis 350-hp, 3600-rpm explosion-proof motor.

IN HUNDREDS OF FIELDS... the durability of Jones Sucker Rods is unmatched.



THOUSANDS OF STRINGS are providing economical and efficient service

ROUND THE CALENDAR SERVICE... year-after-year, trouble-free, dependable.

PROVING GROUND FOR JONES SUCKER RODS. There is no better proof than performance. In the field, Jones Sucker Rods meet and exceed every claim made for them. That's because they are designed and made by specialists... who have pioneered every major rod improvement.

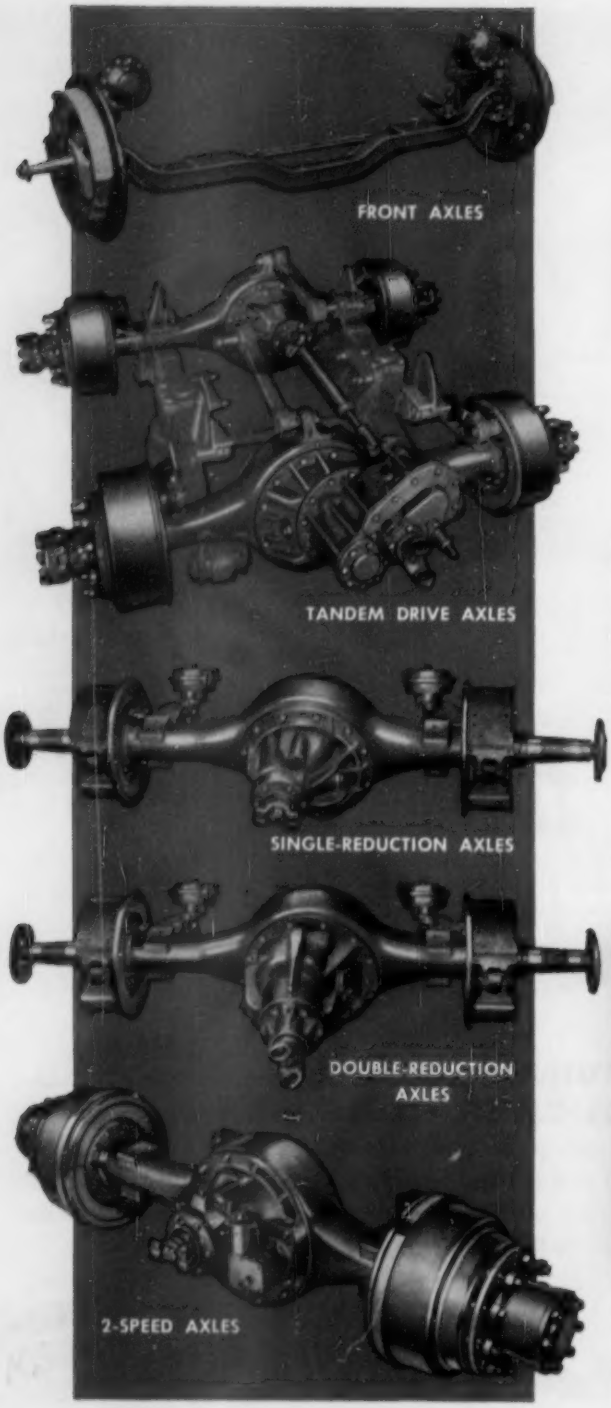
JONES
SUCKER RODS

Look for the "GREEN" Rods

PESA

THE S. M. JONES COMPANY
Division of Buffalo-Eclipse Corporation

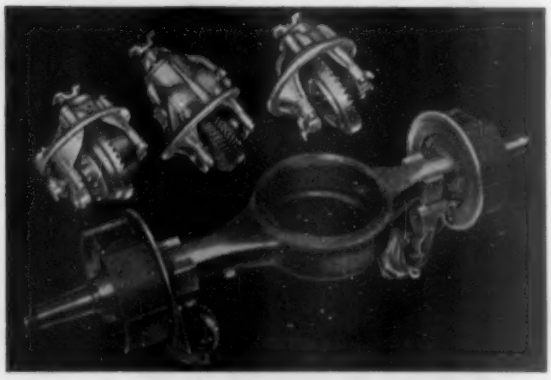
General Office and Factory: **TOLEDO, OHIO**
Sales Office: Kennedy Building, **TULSA, OKLAHOMA**
Export Sales Representatives: IDECO – Division of Dresser Equipment Company, Republic National Bank Building, Dallas, Texas and Chanin Building, New York City



EATON AXLES

Outstanding Performance Cuts Hauling Costs, Assures Longer Vehicle Life

Strict adherence to exacting quality standards, the most modern of production procedures, and important design advancements developed through Eaton's years of axle experience, combine to offer the truck operator axles with many worthwhile benefits. Eaton Axles, engineered for rugged stamina, keep trucks on the job, hold down operating and maintenance costs, and deliver more vehicle miles at lower cost per mile.

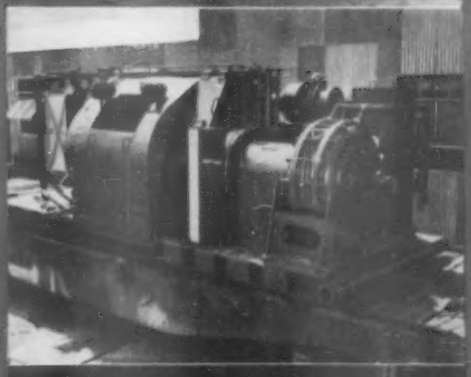


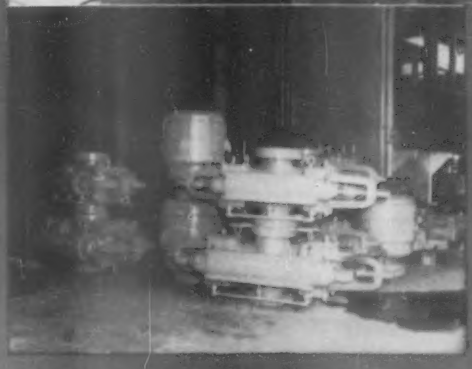
This rugged housing, used in famous Eaton 2-Speeds, is also used for Eaton single-reduction and double-reduction axles. The three types of heads are interchangeable.

EATON — *AXLE DIVISION*
MANUFACTURING COMPANY
CLEVELAND, OHIO

PRODUCTS: Sodium Cooled, Poppet, and Free Valves • Tappets • Hydraulic Valve Lifters • Valve Seat Inserts • Jet Engine Parts • Rotor Pumps • Motor Truck Axles • Permanent Mold Gray Iron Castings • Heater-Defroster Units • Snap Rings Springtites • Spring Washers • Cold Drawn Steel • Stampings • Leaf and Coil Springs • Dynamatic Drives, Brakes, Dynamometers

what AVONDALE'S O.T.* means to the Oil Man





"AVONDALE'S OIL TOOLS DEPARTMENT is a complete, efficient and powerful force to turn your repair problems into pleasant routine. The best possible equipment is provided for your needs and workmanship is expert in the fullest sense. For large or small repair jobs—hydramatic brakes, crown & traveling blocks, blow-out preventers and control manifolds, drawworks, swivels, dragline buckets and a wide diversification of other oil machinery jobs—the Oil Tools Department is your best source of satisfaction. Call Avondale today . . .

A new and complete Oil Tools Machine Shop has just been opened at Avondale's Harvey Plant.

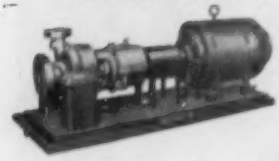
SHIP BUILDING • SHIP REPAIRING • FOUNDERS • PROPELLERS • STRUCTURAL STEEL

AVONDALE MARINE WAYS, INC.

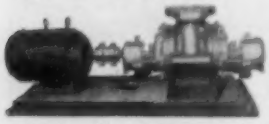
CABLE ADDRESS "AVONWAYS"

P. O. BOX 1030 • PHONE UNiversity 6-4561 • NEW ORLEANS 8, U. S. A.

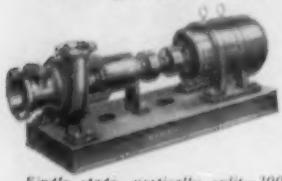
AN I-R PUMP FOR EVERY REFINERY APPLICATION



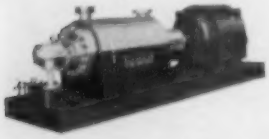
Single stage, vertically split—20-3200 gpm, heads to 600 ft.



Single and two stage, vertically split—20-3500 gpm, heads to 1100 ft.



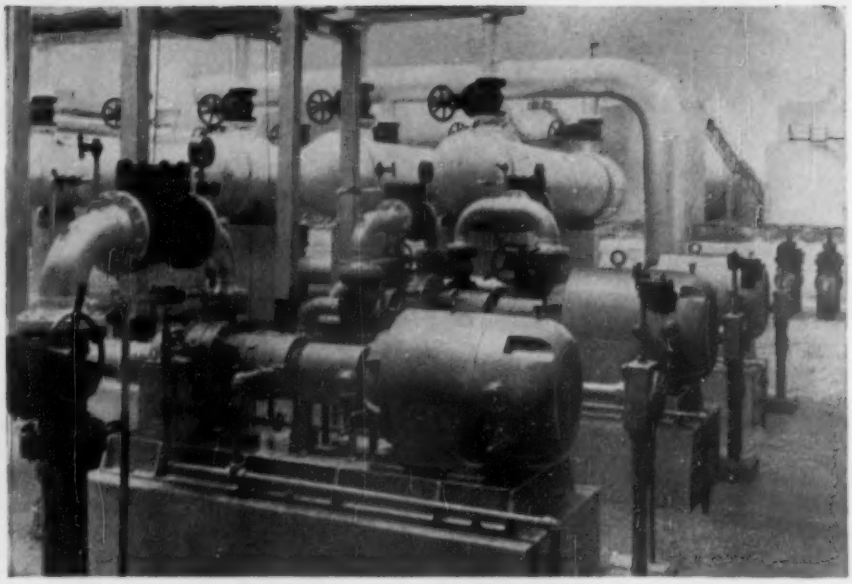
Single stage, vertically split—200-7000 gpm, heads to 225 ft.



Multi-stage horizontal diffusor type—450-3000 gpm, heads to 6000 ft.

Multi-stage vertical diffusor type—20-400 gpm, heads to 4800 ft.

Single or multi-stage vertical turbine pumps—60-35,000 gpm, heads to 150 ft. per stage.



How IR refinements in pump design mean long range savings in REFINERY SERVICE

What determines your choice when selecting a pump for a given job?

You want the pump that gives you the *most* for the money—the most *dependable* service, highest *sustained* efficiency, and lowest year-after-year maintenance cost. And all these result from refinements in pump design and manufacture.

In all I-R process pumps, these refinements have been carried to the fullest extent. Unsurpassed metallurgical facilities assure proper material selection and heat treatment of all pump parts to meet actual service conditions to best advantage. Casings, impellers, wearing rings, shaft sleeves are built of materials formulated to minimize the effects of corrosion, erosion, expansion and thermal shock.

Running clearances of all moving parts are proportioned not just for a high initial efficiency, but for maximum sustained efficiency year after year. Easier accessibility for inspection or servicing cuts down-time. Extensive interchangeability of parts throughout the entire I-R line simplifies stocking of replacement parts.

Your Ingersoll-Rand representative will be glad to give you the complete story on the extra-value features of any I-R pump. His specialized design and application experience can save you time and effort on any job.

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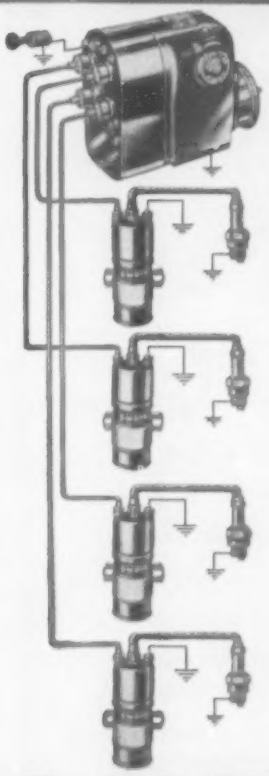

for Large Bore Stationary Gas Engines

AMERICAN BOSCH

LOW TENSION MAGNETO IGNITION SYSTEM

The System comprises the American Bosch MRB Low Tension, shielded Magneto and individual High Tension Ignition Transformers mounted at each engine cylinder. (See 4 cyl. installation diagram at left). Low tension current, generated in the Magneto, is distributed through low tension leads to the Transformers. Here, the electrical energy is stepped-up to high voltage and conducted to the spark plugs by short cables—shielded if desired. The rugged, heavy-duty, high tension Transformers (as illustrated above) are available with or without shielding for use in the American Bosch System or other low tension systems employing magneto or battery ignition.

Energy losses and corona effects which occur with long high tension cables are eliminated. The possibility of fire and explosion hazard is minimized where engines operate in combustible vapors . . . radio and TV interference may be greatly reduced by complete shielding. These important advantages, combined with the outstanding electrical and mechanical features of the American Bosch Low Tension Magneto, offer maximum spark efficiency for large bore, stationary engines operating under severest conditions. For peak engine performance and safer, continuous service, get the facts from American Bosch, Springfield 7, Mass. A Division of American Bosch Arma Corporation.

AMERICAN BOSCH

It's the Nash!

There are no mechanical complications in a Nash Compressor. A single moving element, a round rotor, with shrouded blades, forming a series of buckets, revolves freely in an elliptical casing containing any low viscosity liquid. This liquid, carried with the rotor, follows the elliptical contour of the casing.

The moving liquid therefore recedes from the rotor buckets at the wide part of the ellipse, permitting the buckets to fill with gas from the stationary Inlet Ports. As the casing narrows, the liquid is forced back into the rotor buckets, compressing the gas, and delivering it through the fixed Outlet Ports.

Nash Compressors produce 75 lbs pressure in a single stage, with capacities to 6 million cu. ft per day in a single structure. Since compression is secured by an entirely different principle, gas pumping problems difficult with ordinary pumps are often handled easily in a Nash.

Nash simplicity means low maintenance cost, with original pump performance constant over long periods Data on these pumps sent immediately on request

No internal wearing parts.

No valves, pistons, or vanes.

No internal lubrication.

Low maintenance cost.

Saves floor space.

Desired delivery temperature automatically maintained.

Slugs of liquid entering pump will do no harm.

75 pounds in a single stage.

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- **SPINK-GEL:** High-yielding, finest quality Wyoming bentonite. Exceptional lubricating properties! Low water loss! Requires little to make viscous mud that floats cuttings.
- **SPINK-O:** Medium weight—low filter loss! Combines outstanding qualities of Gleason and Spink-Gel.

All durably sacked in 50-lb. water-repellent asphalt-lined bags for easy handling.

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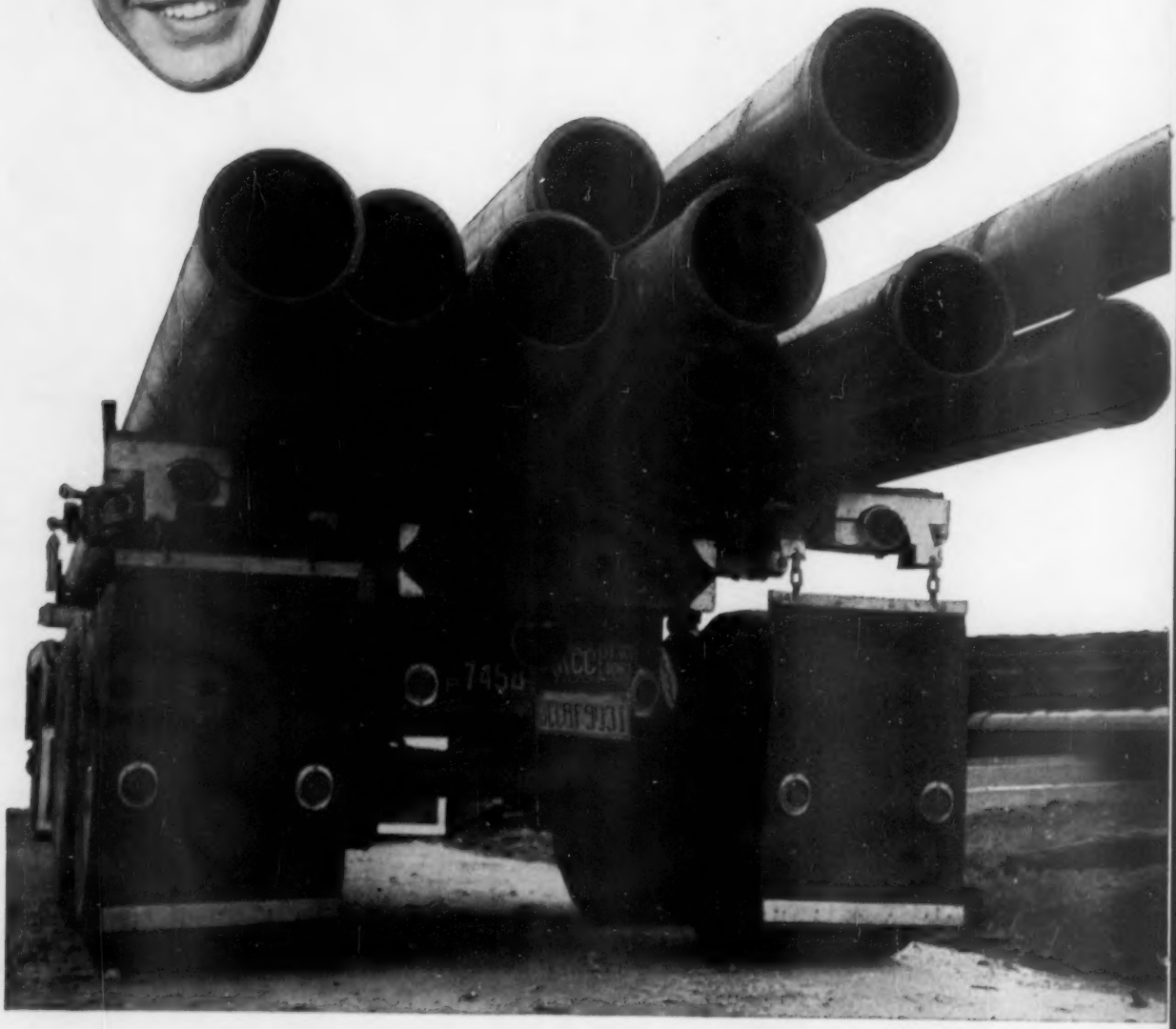

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World's Widest Range of Standard Steels

ON CASING AND TUBING

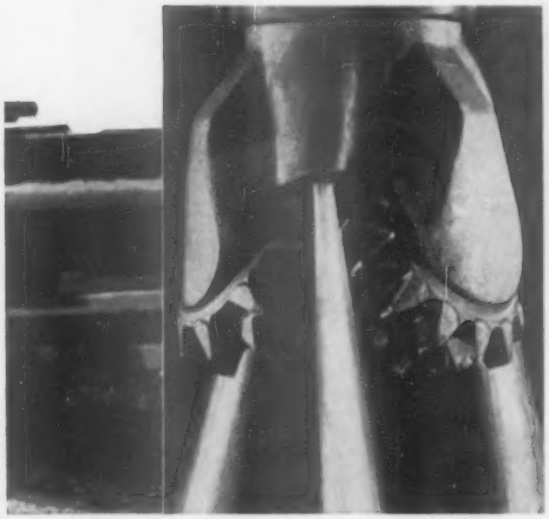
Call your Republic Oil Country Distributor. He is an independent business man. His well-being depends on furnishing you top-quality materials wherever you need them. And he's a specialist at doing just that . . . fast.

When you order Republic Electric Weld or Seamless Casing and Tubing from him, his service will speak for itself. Then after you experience how easy these products are to run and how dependably they perform, you'll see why you save both time and trouble by specifying Republic Casing and Tubing.

Ease of installation and dependability of these outstanding products stem directly from manufacturing know-how. In the case of Electric Weld Casing and Tubing we start with flat rolled steel of uniform width and thickness. Both sides are closely inspected to assure pipe of smooth surface, free from defects inside as well as outside. The steel is then cold formed and welded into a strong, concentric, ductile tube—normalized to secure uniform grain structure, and cold sized to assure high yield strength and true round cross section. Result: Uniform strength throughout to resist collapse—uniform thickness of metal in threaded ends to help avoid costly pullouts.

Republic Seamless Casing and Tubing is made to no less rigid specifications. Quality is built in by experienced craftsmen using the latest methods, machines and scientific controls, in the most modern seamless mill in the world.

So, whatever your casing and tubing needs, contact your Republic Oil Country Distributor. He carries Republic Electric Weld in grades H-40 and J-55, sizes 2⅛" through 13⅜" O.D.; and Republic Seamless in grades J-55 and N-80, sizes 2⅜" through 9⅝" O.D. Or mail coupon for further information.



QUICK DELIVERY OF SPINNING CHAIN is yours through your Republic Oil Country Distributor. Of special analysis alloy steel, Republic Spinning Chain is tough and resistant to shock and abrasion. You can get it in sizes ⅝ inch and ¾ inch x 14 feet through 33 feet. Republic Spinning Chain has been accepted by the Division of Industrial Safety of the State of California. Your Republic Distributor also carries Republic's high-quality boomer chain, winch line end chain, and truck and tractor tire chains.

DRILL BIT SERVICE LIFE is greatly increased, thanks to use of specially developed Republic Alloy Steels. Their toughness and ductility assure maximum resistance to impact and torsional stresses. Hardenability increases effective life against abrasive strata. Republic alloy steels are well suited to a wide variety of oil field equipment applications. Typical examples are tongs, blocks, draw works components.

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No. 1 choice —for Powering Oil Field Utility Units

WISCONSIN Heavy-Duty *Air-Cooled* ENGINES

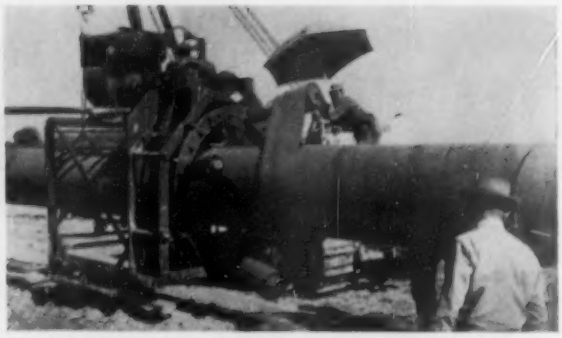
A new era in the design and economical operation of oil field utility units was started in 1937 with the first application of a Wisconsin Heavy-Duty Air-Cooled Engine to a high speed rotary pump. This initial unit weighed only about one-third as much as the heavy, slow-motion hopper-cooled engines previously used, which were connected through massive gears to heavy reciprocating pumps.

Since that modest beginning twenty years ago, the demand for Wisconsin-Powered oil field equipment has multiplied by leaps and bounds and now includes every type of machinery that can be successfully operated by engine power within a 3 to 36 hp. range. Several typical modern installations of Wisconsin-powered equipment are shown on this page.

Wisconsin Heavy-Duty Air-Cooled Engines are especially desirable for oil field service not only because of their heavy-duty operating dependability under all weather and climatic conditions, but also because of their light weight and compactness of the installation, extremely efficient AIR-COOLING at all temperatures from sub-zero to 140° F., and basic High Torque design that takes care of shock loads without quitting. Wisconsin-powered installations also represent savings in concrete, building materials, and installation time and labor.

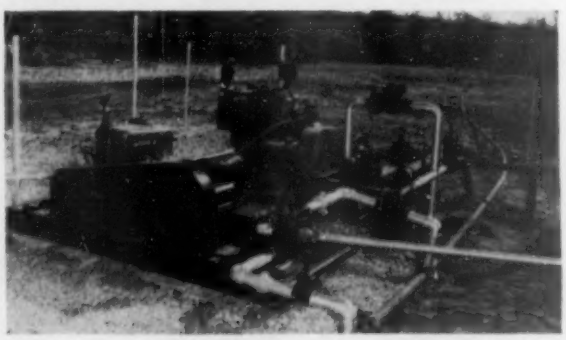
All Wisconsin Engines from the smallest to the largest can be adapted to operate on natural gas, butane, propane, kerosene or fuel oil of 38-42° Baume gravity and 35 Octane rating or better.

YOU can't do better than to specify "Wisconsin Power" for your oil field utility units . . . for better performance, longer engine life, lowest cost maintenance and economical operation.

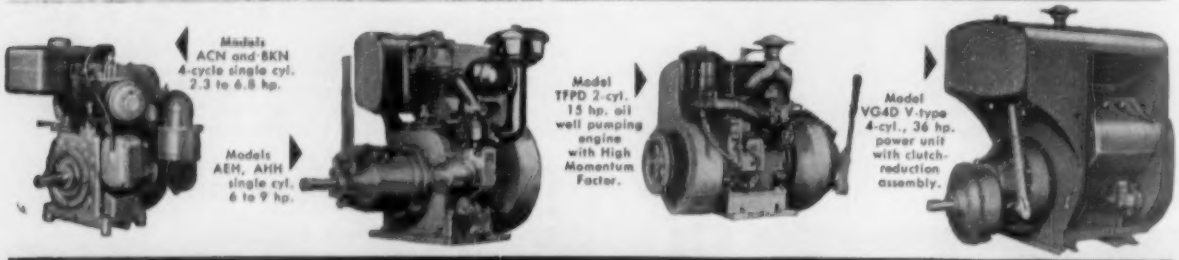


● Wisconsin-powered pipe-wrapping machine putting polyethylene tape and glass fibre wrap on 10-mile section of American-Louisiana's 30" line. (Plans also include tape application to 122 miles of 22" pipe). Photo courtesy Pipe Line Industry.

● Two skid-mounted Wisconsin-powered units, operating on a semi-developed oil lease in North Central Oklahoma . . . handling salt water disposal, separating gas and fluids (in the tall tank) and pumping finished oil to the marketing company's pipeline.



● Working on an Oklahoma oil lease, a Model TFD 2-cylinder Wisconsin engine (left), drives a specially-built Deming pump trimmed with special alloys for handling salt water; a Model VG4D (right) 4-cylinder engine with clutch, is belted to an H-35 Roper oil transfer pump, handling 28 BPH at 600 psi.


Models ACN and BKN 4-cycle single cyl. 2.3 to 6.8 hp.
Models AEH, AHH single cyl. 6 to 9 hp.
Model TFPD 2-cyl. 15 hp. oil well pumping engine with High Momentum Factor.
Model VG4D V-type 4-cyl., 36 hp. power unit with clutch-reduction assembly.

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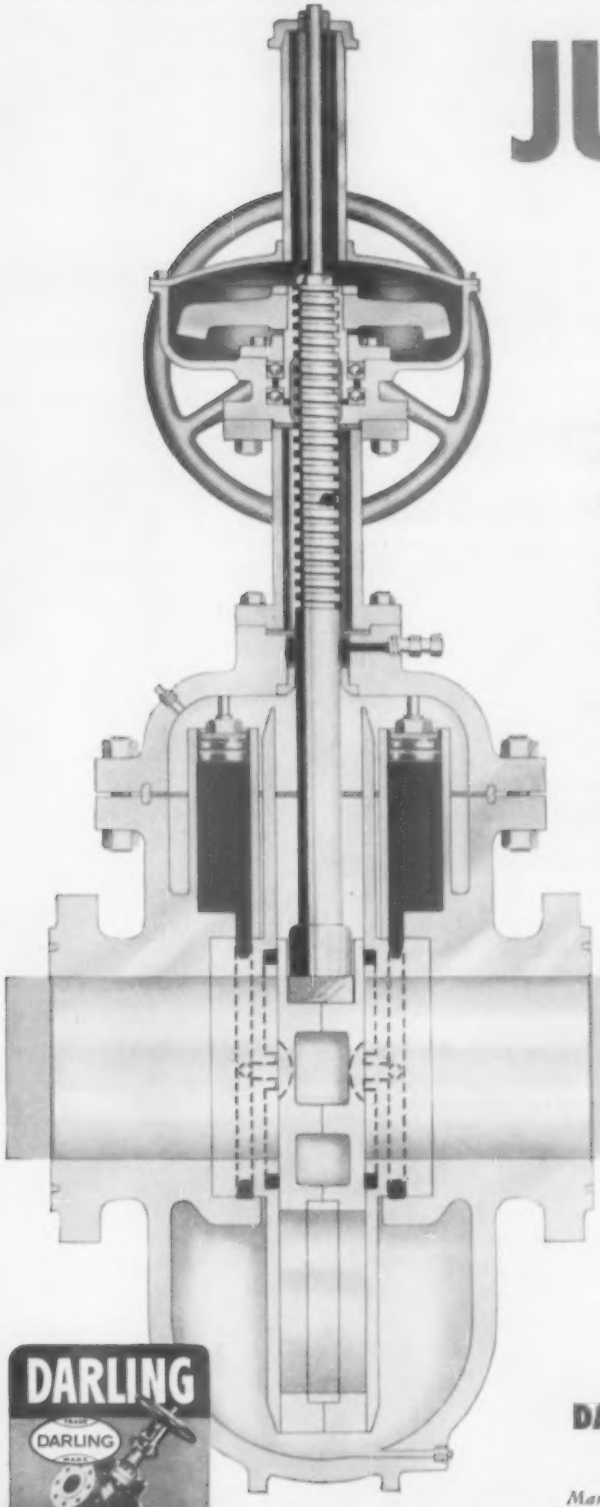
Why DARLING-McEVOY 2-way conduit gate valves

JUST CAN'T LEAK!



IT'S simple. Regardless of flow direction, a sealant *automatically* completes a pressure-tight seal between the downstream seat and gate. This is the inevitable result of pressure differential at the time of closure.

Similarly there can be no behind-the-seat leakage! For, as shown here, each seat is *double-grooved* to seal against the valve body as well as the gate.

It is this unique feature, with its positive, automatic self-sealing, that establishes the Darling-McEvoy conduit gate valve as the world's tightest!

Isn't it likely that you could benefit by such valve performance as time goes on? Get the *whole* story . . . get details on this and the other unusual features that make these field-proved valves truly outstanding for low-cost, trouble-free operation. Just ask for Bulletin 5402.

Section view of Darling-McEvoy 2-way conduit gate valve, showing twin sealant reservoirs, double-gate parallel seat design, and sealing grooves. Sizes: 8 inch and larger.

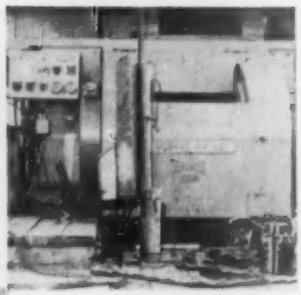
DARLING VALVES

DARLING VALVE & MANUFACTURING CO.
Williamsport 1, Pa.

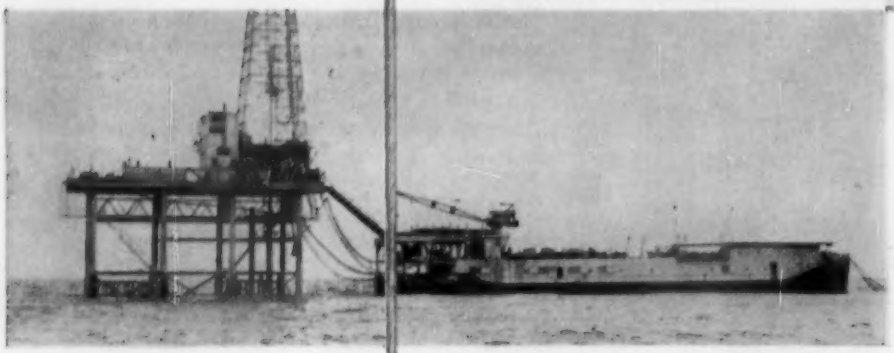
Manufactured in Canada by Sandilands Valve Manufacturing Co., Ltd., Galt 19, Ont.

Another LeBus Grooving Offshore Job!

KERR-McGEE



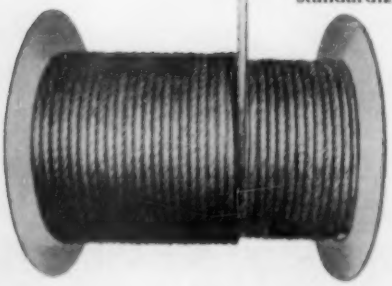
LeBus Counterbalanced Grooving used on Emsco Eda Drawworks, equipped with 34" x 51⅝" drum and 1⅜" wire line.



The Kermac Rig 48 and Kermac Drilling Tender III.

To reduce wire line wear to the very minimum and increase the speed and efficiency of the drawworks, at least 95% or more operators, these days, are demanding LEBUS COUNTER-BALANCED SPOOLING. Among the more than 2500 rigs equipped with LeBus Grooving is the Kermac Rig 48 now on offshore location in the West Delta area. So important has LeBus Grooving become that rig owners as well as manufacturers of hoisting equipment are standardizing on this revolutionary method of spooling wire line.

Be sure your drilling hoists are modern. Insist that they have LEBUS COUNTER-BALANCED SPOOLING on the drums.



Get all the facts — contact a LeBus representative or LeBus direct — NOW.

Patent Nos.: Counterbalanced Spooling, Nos. 2,734,695; 2,732,130. Controlled Parallel and Helical Spooling, Nos. 2,708,080; 2,620,996. Appli. of grooving, Nos. 2,399,926; 2,204,938. Removable End Fillers, No. 2,216,819. Other patents pending.

LeBus International Engineers, Ltd.

Executive Offices: 305 Wichita National Bank Building, WICHITA FALLS, TEXAS
Sales, Service Control and Warehouse Stock: LONGVIEW, TEXAS

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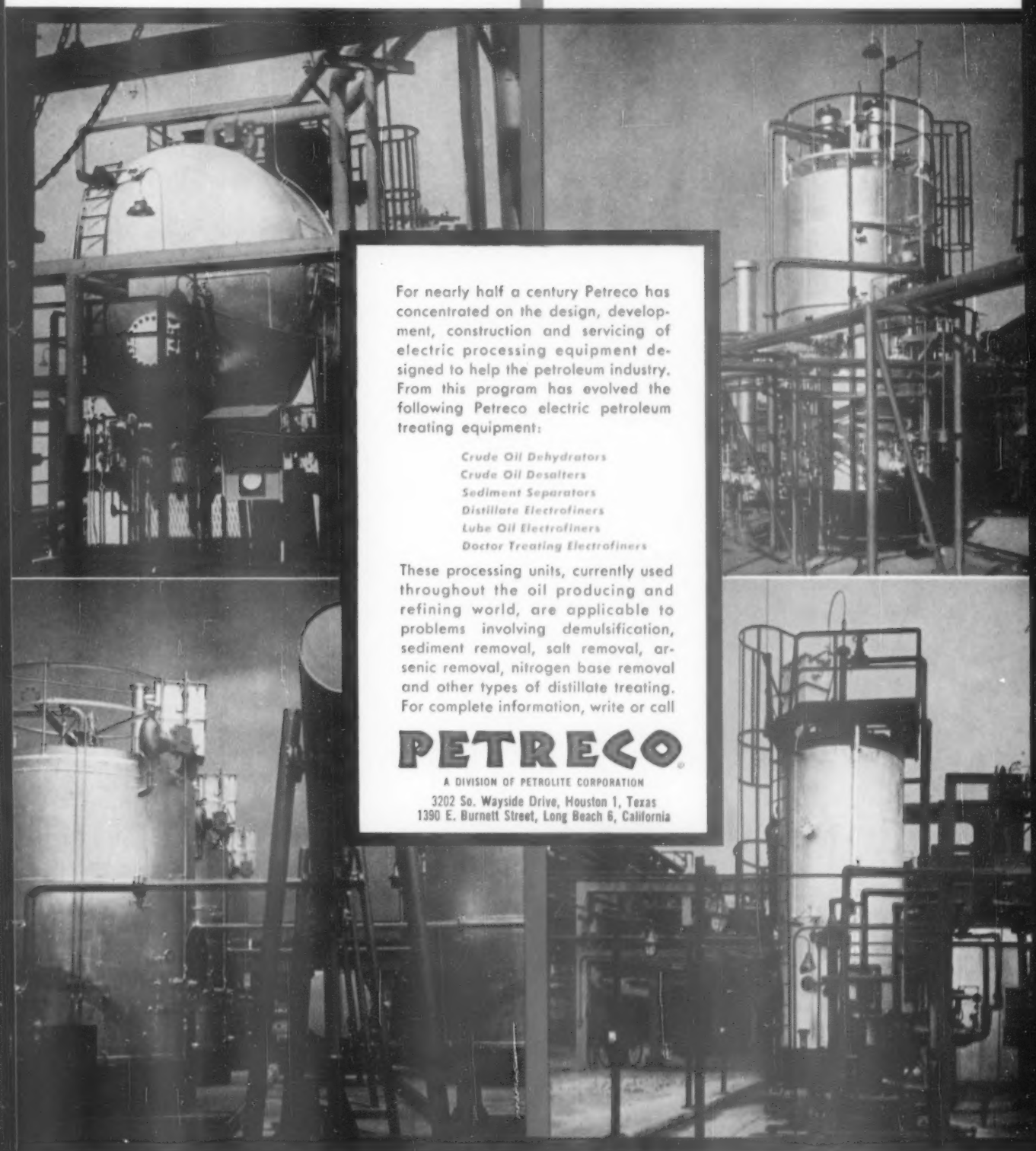

For nearly half a century Petreco has concentrated on the design, development, construction and servicing of electric processing equipment designed to help the petroleum industry. From this program has evolved the following Petreco electric petroleum treating equipment:

Crude Oil Dehydrators
Crude Oil Desalters
Sediment Separators
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These processing units, currently used throughout the oil producing and refining world, are applicable to problems involving demulsification, sediment removal, salt removal, arsenic removal, nitrogen base removal and other types of distillate treating. For complete information, write or call

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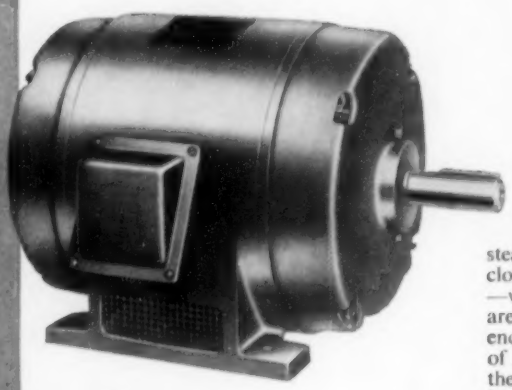
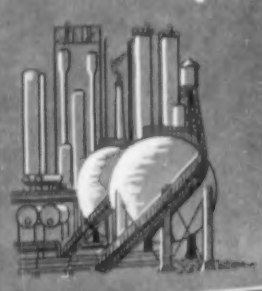


With single-phase Type DY capacitor start Motors, Wagner furnishes a separate weatherproof control box complete with starting and running capacitors and voltage relay.

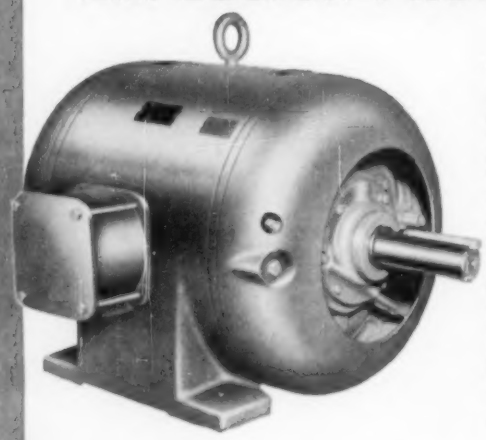
OIL WELL PUMPING MOTORS

Wagner cast-iron frame oil well pumping motors, either polyphase or single-phase, are especially designed for rugged, steady, outdoor service. The enclosures are completely drip-proof —virtually splash-proof. Air intakes are located at the bottom of the endplates to admit a cooling flow of air to the motor, while retarding the entrance of water. Outlets are located at the base of the frame, one on each side. Screened openings keep reptiles or small animals from entering the motor. The conduit box is moisture-proof and dust tight. For locations where only single-phase current is available, Wagner can furnish high power factor type capacitor-start motors with the same enclosures. You can get Wagner Oil Well pumping motors *from stock* in your immediate area.

...in the refinery



EXPLOSION-PROOF MOTORS



These powerful Type JP polyphase motors are expressly built for applications in explosive atmospheres. They are approved for Class I Group D hazardous locations. Totally-enclosed fan-cooled construction, with frames and endplates of cast iron, makes them suitable for indoor or outdoor use and for installations where corrosion is a problem. Available in ratings through 250 hp.

For full information, write for Bulletins MU-132 and MU-137. Thirty-two branch offices are ready to assist you in any motor application problem.

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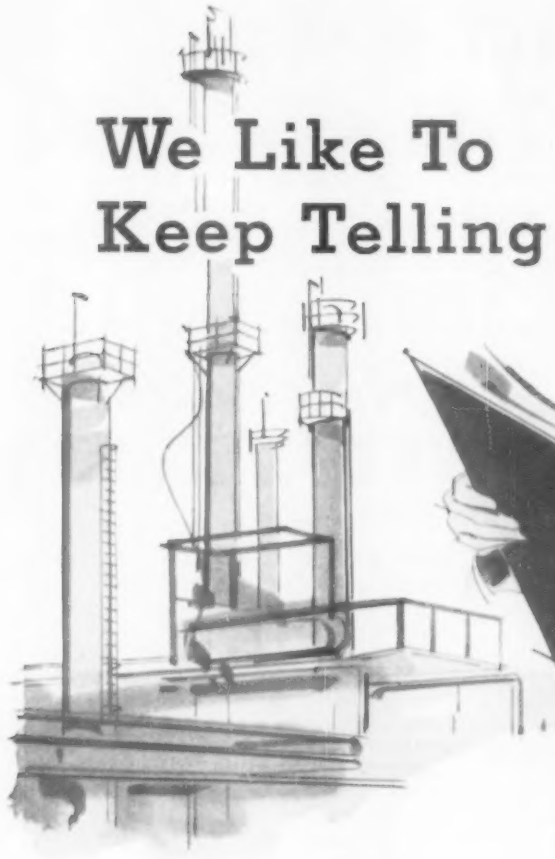

You are aware that Procon is a leading construction organization. But we're not sure that you know the extent of our world-wide operations, the broad range of projects that Procon is efficiently handling in the petroleum, petrochemical and chemical industries.

That's the reason we like to keep telling you that Procon is actively concerned with construction projects throughout the world. The rapidly growing list includes:

Atmospheric, Cresol and Vacuum Distillation units	Gas Concentration units
Fluid Catalytic crackers	Crude stabilizers
Poly plants	Office buildings
Catalytic reformers	LPG facilities
Rexformers	Hydrosulfurizers
Thermal crackers	Complete refineries
Waste disposal systems	Turnarounds

That's only a partial list, but if you have a project in the planning stage you can be certain that Procon has the experience, know-how and adequate facilities to handle it. Just give us a chance!

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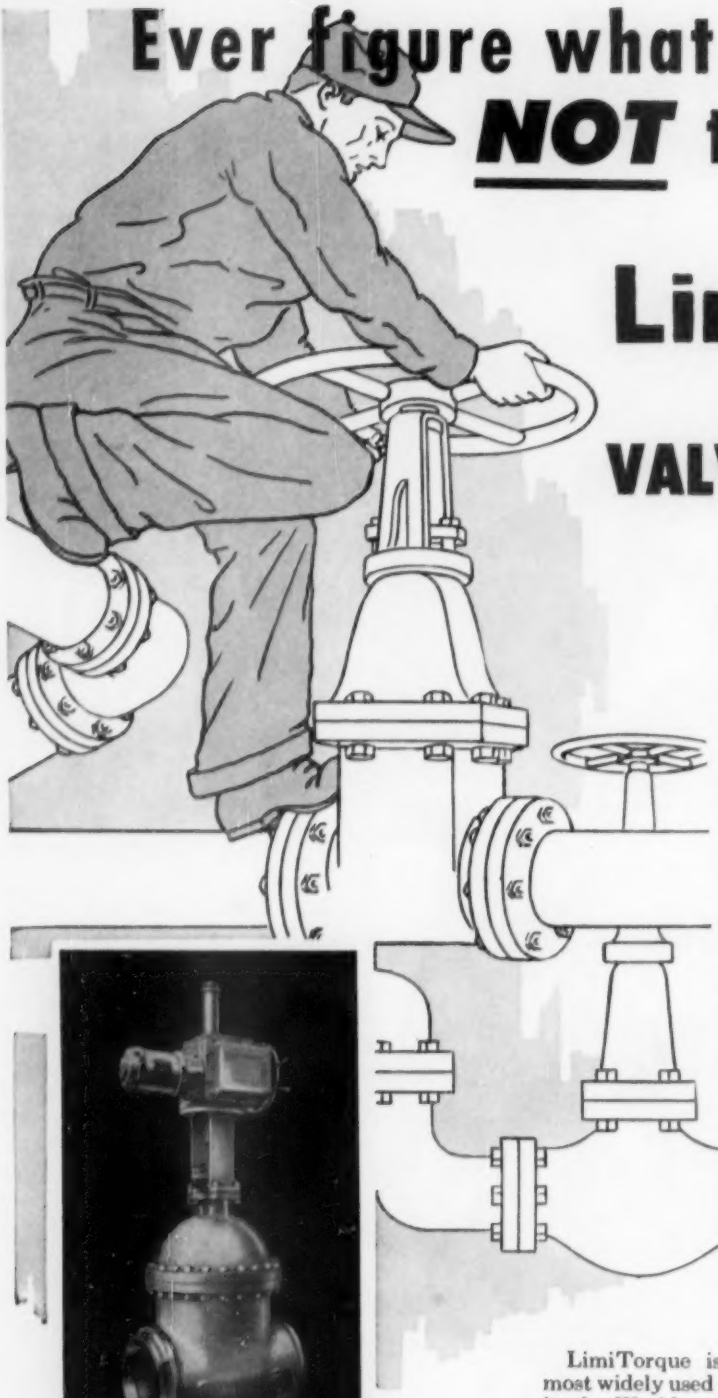

How much does opening and closing Valves *by hand* cost you—in man-hours—in physical danger to workmen who must climb to high or dangerous locations?

How much time, labor, and money could be saved in your plant by opening and closing valves *automatically*—at correct operating speeds—by the mere "push of a button"? With LimiTorque, one finger does the work of many hands. LimiTorque control permits one man to operate, and know the exact position of each valve from a central, conveniently located control panel.

LimiTorque protects valve seats, discs and stems from damage, by automatically shutting-off power source, should an obstruction interfere with valve closing. Valves operated by LimiTorque are always seated tightly, because the seating thrust of valve disc is accurately maintained in each closing-cycle, due to the patented torque limiting mechanism.

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EMSCO

SWIVELS

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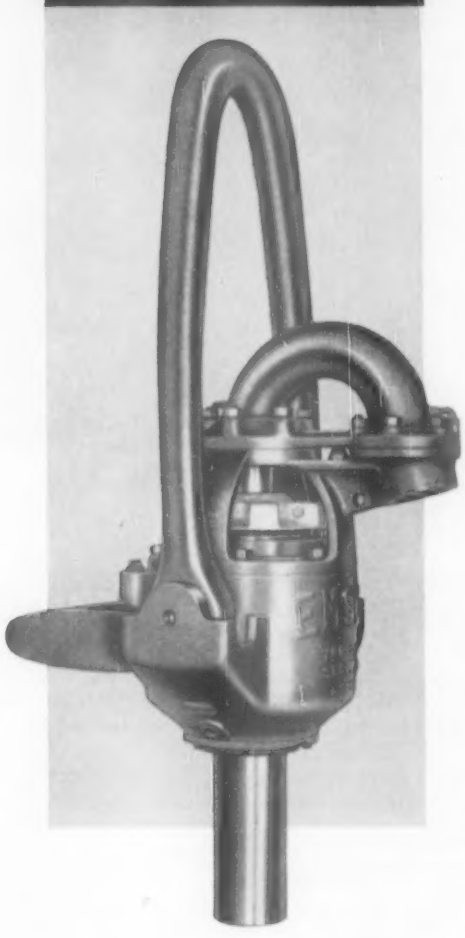
for extra speed, economy and safety



EMSCO SWIVELS

Designed for easier, more economical handling, servicing and maintenance, Emsco "L" Series Swivels combine many important time and labor saving features. Reduced weight and height, increased hook clearance, improvement in bail design, replaceable bail pins, and high capacity, true-cone roller bearings spell trouble-free, dependable performance.

EMSCO TRAVELING BLOCKS

Safer and easier to operate, Emsco "R" Series Traveling Blocks are fast falling, straight traveling, and slimlined — with a low center of gravity that eliminates canting. Sheaves are made with rolled forged steel rims . . . grooves are flame hardened to reduce wire line wear.

EMSCO

TRAVELING BLOCKS

There are Emsco Swivels and Traveling Blocks, as well as Crown and Hydra-Hook Blocks in a full range of sizes.

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Look at the facts

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Allis-Chalmers tractors start the day with *go*—not greasing. You can operate six months on a 40-hour week basis with just one lubrication of truck wheels, front idlers and support rollers. Designed with Positive Seals and tapered roller bearings, these units are protected from dust, loose sand, soft ground, mud or water. You not only gain *working time*, but save labor and lubricant costs as well. And there's no costly damage from greasing neglect.

Modern shift pattern speeds digging

Here's a big timesaver on slush pit digging. It takes just half the time and effort to change from low forward to fast reverse with the Allis-Chalmers HD-6, HD-11, or HD-16 transmission. One simple shift of the gear lever does the job. You gain production time—up to 25 percent on actual test—on bulldozing, backfilling and other jobs calling for a short forward-backward cycle.

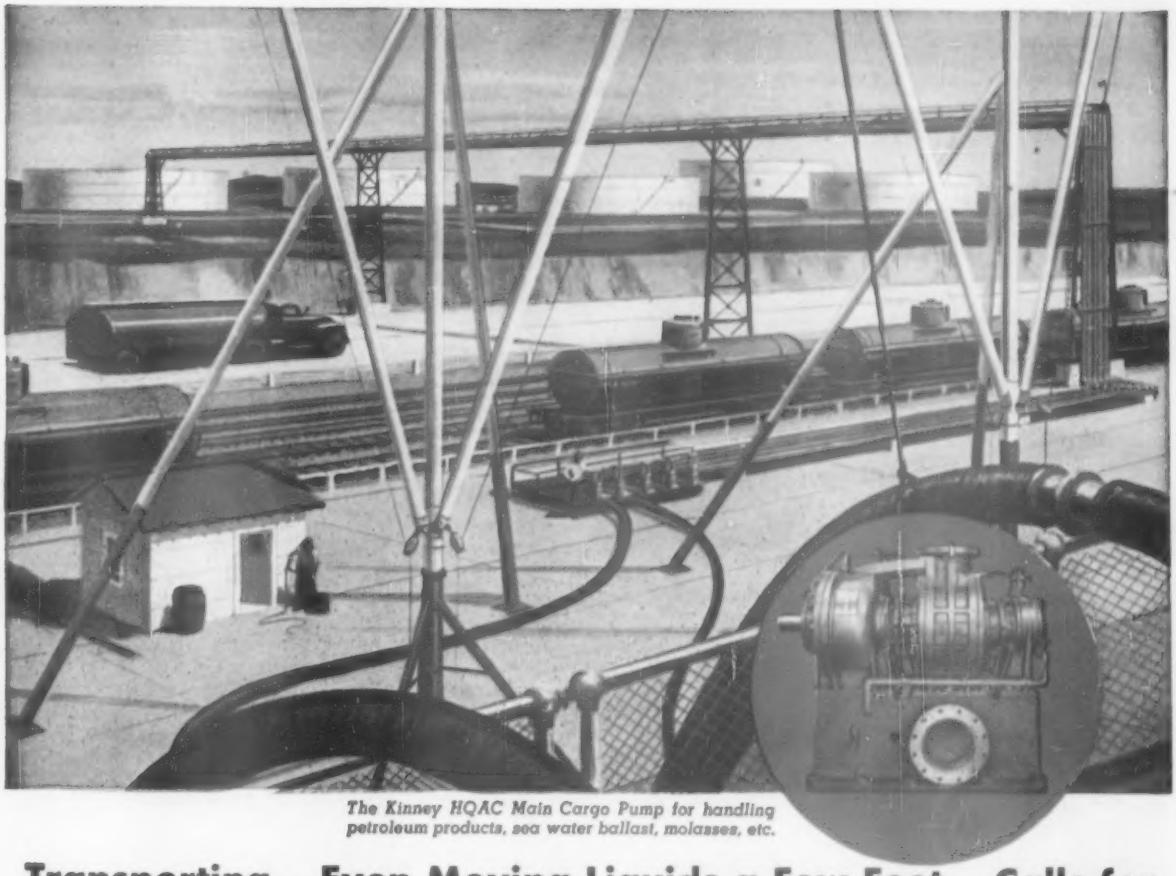
Unit construction cuts servicing time

No need to remove transmission or engine, radiator, grille, when servicing or removing an Allis-Chalmers master clutch. This unit can be removed without disturbing adjacent parts. This is also true of other main assemblies—final drive gear, transmission, steering clutches, engine and truck frame. You can quickly substitute an assembly and put the tractor to work while servicing the original unit. As a result, hours of *costly service and downtime are saved* because of Allis-Chalmers advanced design.

These are just three examples of Allis-Chalmers timesaving, money-making features. Your Allis-Chalmers dealer can point out many more. See him now for the full story.

ALLIS-CHALMERS, CONSTRUCTION MACHINERY DIVISION, MILWAUKEE 1, WISCONSIN

ALLIS-CHALMERS A-C



The Kinney HQAC Main Cargo Pump for handling petroleum products, sea water ballast, molasses, etc.

Transporting...Even Moving Liquids a Few Feet...Calls for PUMPS

All of these jobs: *drawing a glass of water . . . transferring a tanker load of crude oil . . . transporting a carload of glucose or molasses . . . racking off barrels of beer . . . injecting metered additives into beauty lotions or chemical compounds* . . . all have one thing in common. YOU MUST HAVE A PUMP TO DO THEM—ECONOMICALLY.

Divisions of The New York Air Brake Company provide the Pumps to perform these and thousands of other functions. From alcohol or gasoline to heavy waxes, tars, and asphalt, there is a pump bearing the NY trademark to which you can confidently turn for a solution to your problem. It is no empty claim that, "if it will flow thru a pipe, The New York Air Brake Company makes a pump to pump it."

KINNEY MFG. Division produces the famous KINNEY Rotating Plunger and Heliquad Gear Pumps that handle all sorts of difficult liquids and semi-solids. The AURORA PUMP Division offers Centrifugal and Turbine-type Pumps for deep well, sump, irrigation, fire fighting, boiler feed, condensate return and household use.

And—to provide Fluid Power for drill rigs and other mobile equipment, marine, aircraft, and industrial machinery applications, there are high pressure Hydraulic Pumps . . . HYDRECO Gear Type and DUAL-VANE Pumps from the KALAMAZOO Division and world famous STRATOPOWER Aircraft Hydraulic Pumps from the WATERTOWN Division.

Finally, to complete the Pump story, there are KINNEY High Vacuum Pumps and complete KINNEY Vacuum Systems to provide complete evacuation of air or gases for refining, distilling, electrical, electronic, metallurgical, atomic energy and many industrial processes.

KINNEY MANUFACTURING DIVISION
Boston, Mass.
KINNEY Vacuum Pumps, 0.2 micron, capacity to 5000 cfm; KINNEY Rotating Plunger and Heliquad Liquid Handling Pumps, to 3000 gpm.

AURORA PUMP DIVISION
Aurora, Ill.
Liquid Handling Pumps, AURORA Centrifugals and deep well Turbines, 7000 gpm, 500 ft. heads. APCO Turbine-type 150 gpm, 600 ft. heads. Condensate Return Units.

KALAMAZOO DIVISION
Kalamazoo, Mich.
HYDRECO Gear-Type Hydraulic Pumps, 3 to 120 gpm; Fluid Motors, 3 to 52 hp; Cylinders; Control and Auxiliary Valves; 1500 psi. DUAL-VANE Hydraulic Pumps, 3 to 120 gpm; Fluid Motors, 7 to 140 hp; 2000 psi operation.

VACUUM EQUIPMENT DIVISION
Philadelphia, Pa.
Complete KINNEY Vacuum Systems, Equipment and Components, Vacuum Research and Engineering.

WATERTOWN DIVISION
Watertown, N.Y.
Railroad air brake equipment of all types; STRATOPOWER Hydraulic Pumps for Aircraft, to 3000 psi.

The New York Air Brake Company offers many new developments and advanced performance in pumping equipment. Bring your file of catalog data up to date . . . write today!

THE NEW YORK AIR BRAKE COMPANY

230 PARK AVENUE • NEW YORK 17, N. Y.

INTERNATIONAL SALES OFFICE, 90 WEST ST., NEW YORK 6, N. Y.

Better Fuels for the Tanks of Today's Cars!

Year after year, continually higher horsepower and compression ratio in automotive engines have demanded progressively improved motor fuels.

For more than 40 years UOP-developed processes have been contributing to the petroleum refining industry's consistent ability to keep pace with the growing quality requirements. These processes, always made available to refiners everywhere, include:

CONTINUOUS THERMAL CRACKING, the first major improvement in refining methods, developed by UOP nearly 40 years ago.

POLYMERIZATION, a catalytic process developed by UOP and used to convert refinery waste gases into premium quality gasoline.

FLUID CATALYTIC CRACKING, developed to produce greater yields of liquid products and higher octane number gasoline.

PLATFORMING, with which UOP pioneered the use of platinum in a reforming catalyst and originated the commercial designs of catalytic reforming units.

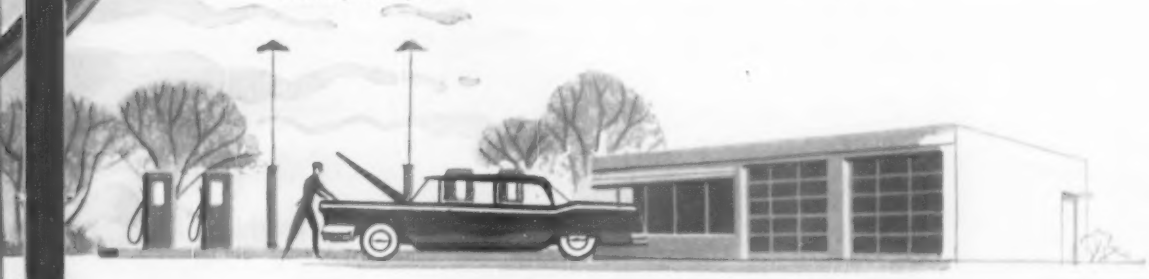
REXFORMING, a combination of UOP Platforming with solvent extraction which permits a refiner to produce even higher octane gasolines.

PENEX, a process which converts the low octane straight chain pentane and hexane fractions into the much higher isocompounds.

"HF" ALKYLATION, a process developed by UOP for producing alkylate, a high octane gasoline blending component, using hydrofluoric acid as the catalyst.

UNIFINING, the process which employs by-product hydrogen from UOP Platforming units to remove sulfur, nitrogen, oxygen and metallic impurities from petroleum distillates by catalytic hydrogenation.

These and other UOP processes, individually or collectively, can provide the answer to most refining problems. We will be glad to tell you how they can help with yours.

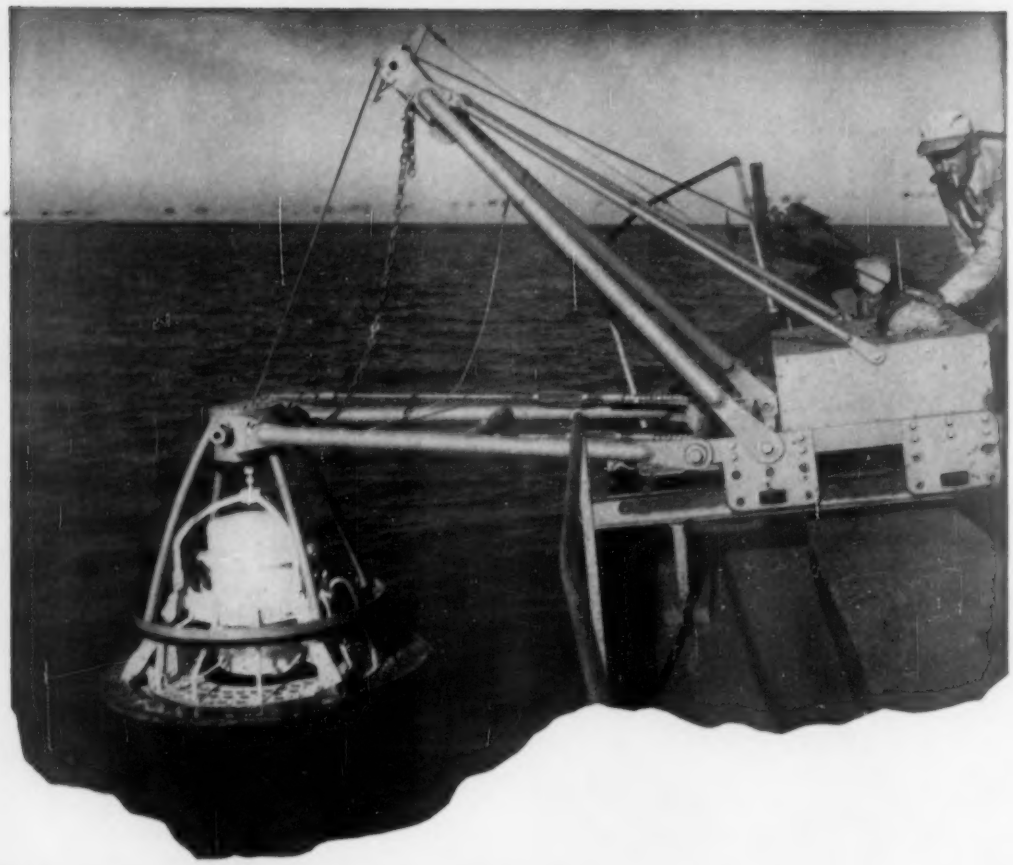


UOP

UNIVERSAL OIL PRODUCTS COMPANY

30 ALGONQUIN ROAD, DES PLAINES, ILLINOIS, U. S. A.

Forty Years Of Leadership In Petroleum Refining Technology



The NORTH AMERICAN *Under Water Gravity Meter*

is unequaled for any under water survey because of its many operating advantages:

- **ACCURACY**
- **DEPENDABILITY**
- **SIMPLE AUTOMATIC OPERATION**
- **MINIMUM PERSONNEL**
- **LESS COST PER STATION**

Complete installation service—Particulars on request!

NORTH AMERICAN GEOPHYSICAL COMPANY

Manufacturers of Geophysical Equipment and Precision Apparatus

3601 W. Alabama, MO 7-2461
Houston 6, Texas

more power to you

for more oil field jobs

All through the oil fields, you'll find abundant proof of the stamina that has made Continentals first choice for so many tough jobs. This Red Seal Model F-162 closed power unit, driving 4 x 6 Dean pump, furnishing water for a 6,500-foot drilling rig in Stonewall County, Texas, replaced another Red Seal which had been in service continuously for eight years. There are Red Seals engineered for every oil field application, at closely-spaced power levels, and available for use on all standard fuels. Ask your oil field supply store or get in touch with the nearest Continental Office.

• • •

GASOLINE AND LPG ENGINES

Model	Cyl.	Bore	Stroke	Displ.	Bare Engine H.P.
N56	4	2¼	3½	56	14.4 @ 2200 RPM
N62	4	2⅛	3½	62	15.3 @ 2200 RPM
Y69	4	2½	3½	69	21.4 @ 2400 RPM
Y91	4	2⅞	3½	91	28.5 @ 2400 RPM
Y112	4	3 5/16	3½	112	32.0 @ 2400 RPM
F124	4	3	4⅛	124	36.5 @ 2400 RPM
F140	4	3 5/16	4⅛	140	42.0 @ 2400 RPM
F162	4	3 7/16	4⅛	162	49.0 @ 2400 RPM
F186	6	3	4⅛	186	60.5 @ 2400 RPM
F209	6	3 5/16	4⅛	209	68.0 @ 2400 RPM
F226	6	3 5/16	4⅛	226	73.0 @ 2400 RPM
F244	6	3 7/16	4⅛	244	79.0 @ 2400 RPM
M271	6	3⅝	4⅛	271	86.2 @ 2400 RPM
M290	6	3¾	4⅛	290	92.2 @ 2400 RPM
M330	6	4	4⅛	330	104.4 @ 2400 RPM
M363	6	4	4 15/16	363	128.9 @ 2800 RPM
B371	6	4⅛	4⅛	371	110.0 @ 2400 RPM
B427	6	4 5/16	4⅜	427	127.0 @ 2400 RPM
G134	4	3½	4⅛	134	34.2 @ 2000 RPM
G157	4	3½	4⅛	157	40.0 @ 2000 RPM
E201	4	3⅝	4⅜	201	65.4 @ 2400 RPM
H227	4	3⅜	5½	227	54.0 @ 1800 RPM
H243	4	3¼	5½	243	57.9 @ 1800 RPM
H260	4	3⅜	5½	260	62.0 @ 1800 RPM
H277	4	4	5½	277	66.4 @ 1800 RPM
K363	6	4	4 15/16	363	123.0 @ 2400 RPM
J382	4	4½	6	382	74.0 @ 1400 RPM
T371	6	4⅛	4⅜	371	119.0 @ 2400 RPM
T427	6	4 5/16	4⅜	427	140.0 @ 2400 RPM
U501	6	4½	5⅛	501	159.0 @ 2400 RPM
R513	6	4½	5⅜	513	164.3 @ 2400 RPM
R572	6	4¾	5⅜	572	182.4 @ 2400 RPM
R602	6	4⅞	5½	602	191.7 @ 2400 RPM
V603	8	4⅜	4¼	603	220.0 @ 2800 RPM
S749	6	5⅛	5½	749	217.0 @ 2200 RPM
S820	6	5⅜	5½	820	237.0 @ 2200 RPM

CUSHIONED POWER DIESEL ENGINES

Model	Cyl.	Bore	Stroke	Displ.	Bare Engine H.P.
ZD129	4	3¼	3⅜	129	34.0 @ 2000 RPM
GD157	4	3½	4½	157	39.0 @ 2000 RPM
*ED201	4	3⅝	4⅜	201	45.8 @ 2000 RPM
HD243	4	3¾	5½	243	55.0 @ 2000 RPM
*HD260	4	3⅞	5½	260	59.0 @ 2000 RPM
*HD277	4	4	5½	277	63.2 @ 2200 RPM
*JD382	4	4½	6	382	72.5 @ 1600 RPM
TD427	6	4 5/16	4⅜	427	106.0 @ 2000 RPM
RD572	6	4¾	5⅜	572	154.0 @ 2000 RPM
VD603	8	4¼	4½	603	175.0 @ 2600 RPM
SD802	6	5 1/16	5½	802	202.0 @ 1800 RPM

*Available for industrial applications only.

SERVICE FACILITIES AND GENUINE RED SEAL PARTS AVAILABLE EVERYWHERE

CONTINENTAL MOTORS ® Powerful as the Nation AMERICA'S STANDARD

Continental Motors Corporation

MUSKEGON, MICHIGAN

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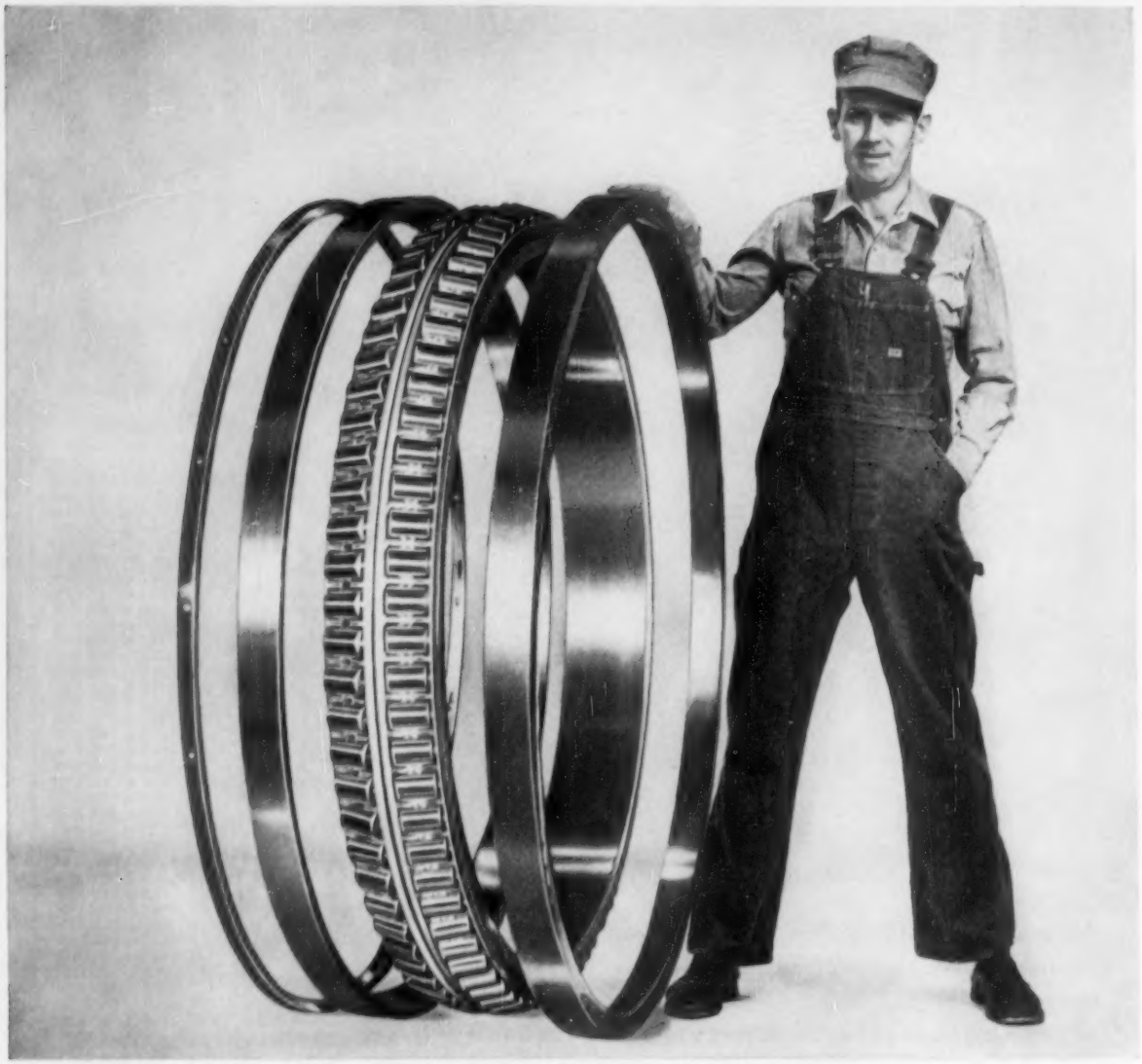
GOOD EQUIPMENT IS BETTER WITH CONTINENTAL RED SEAL POWER

TORRINGTON *CUSTOM-MADE* BEARINGS



"This 63" bearing was custom-made for us—by TORRINGTON!"

Building custom bearings for industry is a Torrington specialty. Whatever the anti-friction assignment—Torrington can design and build the bearing for the job.

When you specify a Torrington job-designed bearing, you're calling on engineers with extensive experience in custom-bearing applications. Torrington will survey your needs, recommend and design the right bearing to provide peak efficiency, economy and service life.

For *any* standard or custom bearing, backed by broad manufacturing and design experience—specify TORRINGTON.

THE TORRINGTON COMPANY
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90th ANNIVERSARY 1865–1955

TORRINGTON BEARINGS

Spherical Roller • Tapered Roller • Cylindrical Roller
Needle • Ball • Needle Rollers

Now the finest of needle valves is available

416 Stainless throughout...

In the Marsh Needle Valve, operating men found a valve that was better all the way through. Then came the call for a valve of like quality and precision for corrosion service . . . to be 416 stainless steel throughout.

The valve illustrated here is the answer. Like the parent valve, this new valve has safety and strength to spare . . . guaranteed for working pressures up to 10,000 psi . . . equally efficient and effective in any lower pressure range.

It too is machined from solid bar stock—in this case, 416 stainless steel. Its precision-ground and-machined stem is hardened 416 stainless. Packing is the special "Marpak" ring . . . one-piece, non-binding, long-lasting. So finely built is this needle throttling and cut-off valve that it can be easily throttled down to exceptionally fine regulation even on extreme pressure.

Read the list of features opposite. Then write for new bulletin No. NV-2 containing complete details.

416 Stainless Steel ...all the way through!

- Body and stem guide machined from bar stock.
- Valve stem, hardened stainless.
- Packing, special Marsh "Marpak" moulded ring.
- Fine stem threads for strength and precision throttling.
- Deep inlet and outlet thread chambers.
- Bodies marked in accordance with MSS regulations.

Maximum Working Pressure 10,000 P.S.I.

Water, oil, gas or corrosive fluids not injurious to 416 stainless steel.

The new all stainless valves (Series 1924) includes globe and angle patterns with double female connections in sizes ⅛", ¼", ⅜", ½", ¾", 1"; also globe and angle valves with male inlet and female outlet in sizes ¼" and ½".

MARSH INSTRUMENT CO. Dept. L, Skokie, Ill.
Sales affiliate of Jas. P. Marsh Corp.

Marsh Instrument & Valve Co. (Canada) Ltd.
8407 103rd Street, Edmonton, Alberta, Canada

HOUSTON BRANCH PLANT: 1121 Rothwell Street, Sect. 15, Houston, Texas

MARSH

"THE STANDARD OF ACCURACY"

exhaustive tests prove:

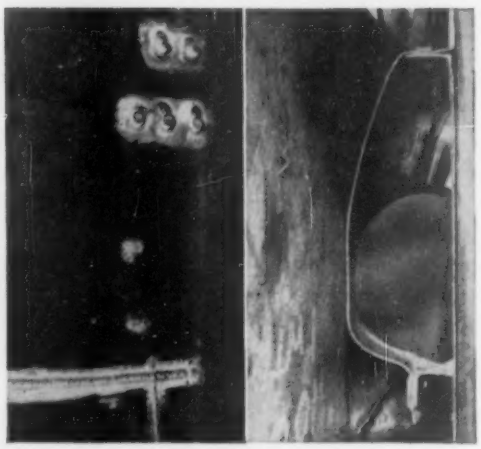
36 YEARS FROM TODAY

TUBESEALS* NOW IN FLOATING ROOF TANKS WILL OPERATE AS EFFICIENTLY AS THEY DO TODAY!

WE DOUBT this can be claimed for any other floating roof seal!

To determine the efficient life-expectancy of the Hammond Tubeseal in service, tests were made under the worst possible conditions to which a floating roof seal can be subjected. The Tubeseal was moved across very rough rivet heads, erection burrs and abrasive weld surfaces, for a total travel of 70,000 feet. This is equivalent to a normal wear of *more than 36 years in actual service.* Moreover, as the tests were run dry, there was the added disadvantage of the absence of lubricating effect normally created by wetted surfaces. Upon completion of these rigorous tests, the scuff band had only worn through the ribs and had barely penetrated through the material, leaving two-thirds of the stock intact; proof that the Tubeseal is unimpaired after traveling 70,000 feet.

The 36 year life-expectancy of a Hammond Tubeseal assumes no mechanical accident and is arrived at in the following manner: Each year a floating roof, in normal service, makes about 48 trips to and from top and bottom of tank. The roof of a 40 foot tank, therefore, will travel 1920 feet per year. Assuming 1920 feet of travel per year (based upon full depth of travel) and applying our accelerated wear test, the Tubeseal will be serviceable for at least 36 years 5½ months.



THE TUBESEAL TEST:

total travel	70,000 feet
travel over vertical weld	46,400 feet (on same line)
Horizontal welded seam crossed	21,200 times
Flat head rivets crossed	63,600 times

CONDITION OF TUBESEAL AFTER TEST: Scuff band had worn through ribs and had barely penetrated into the main material, leaving ⅓ of stock intact.

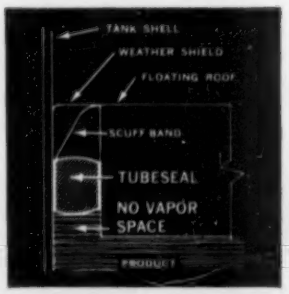
Tests were conducted dry with no aid of lubricant normally resulting from stored product.

Photos show projections used for test. Included are 16" of ⅜" horizontal weld—24" of sharp, irregular vertical weld—2 erection burrs—3 ¾" flat head rivets and 2 ¾" cone head rivets.

THE HAMMOND TUBESEAL
is the most efficient and positive seal known.

it features:

no moving parts
no mechanical maintenance
climate proof
non-corrodible
can operate to bottom of tank or above the top
no vapor space below the seal
entire circumference has tight seal under pressure at all times
longer working life expectancy



NO ROOM FOR VAPORS
NO EVAPORATION
NO CORROSION

patented* ***Write for bulletin TS*

HAMMOND TUBESEAL — THE MOST EFFICIENT AND POSITIVE SEAL KNOWN

HAMMOND IRON WORKS

WARREN and BRISTOL, PA. • PROVO, UTAH • CASPER, WYO. • BIRMINGHAM, ALA.

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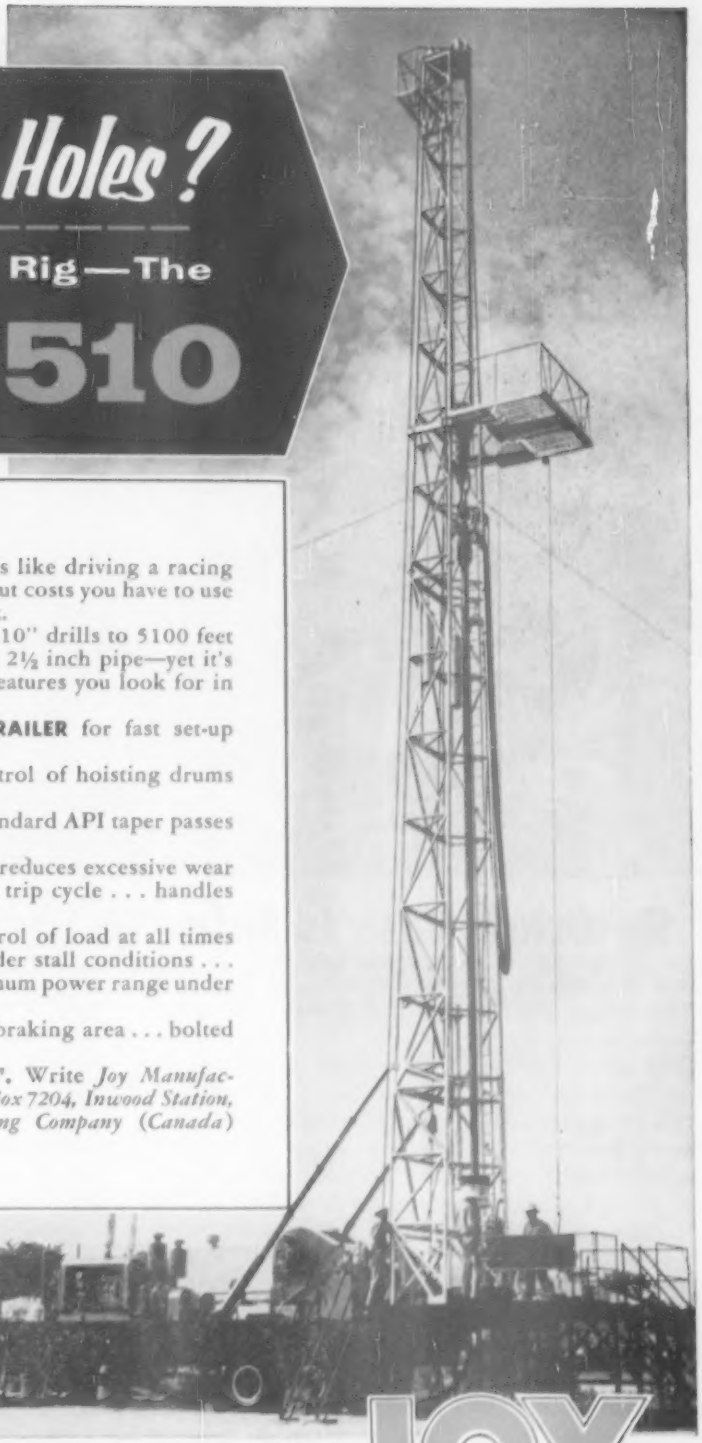
Licensees: CALIFORNIA, CANADA, ENGLAND, BELGIUM, GERMANY, ITALY, FRANCE, JAPAN

Drilling Slim Holes?

Use a Slim Hole Rig—The JOY 510



Drilling Contractors:

Drilling slim holes with a conventional rig is like driving a racing car at tractor speeds—it's wasteful. To really cut costs you have to use a rig specifically designed for slim hole work.

Here's that rig—the Joy "510." The Joy "510" drills to 5100 feet with 3½ inch drill pipe . . . 10,000 feet with 2½ inch pipe—yet it's completely portable. The "510" has *all* the features you look for in a rig:

ENTIRE DRILL UNIT MOUNTED ON ONE TRAILER for fast set-up and tear-down

AIR-OPERATED CLUTCHES for sensitive control of hoisting drums and rotary drive.

LARGER ROTARY TABLE OPENING with standard API taper passes large diameter bits and casing.

HYDROMATIC BRAKE ON HOISTING DRUM reduces excessive wear on brake linings and flanges throughout trip cycle . . . handles heavy loads . . . safer.

TORQUE CONVERTER insures complete control of load at all times . . . three times normal engine torque under stall conditions . . . permits engine to operate within its maximum power range under a wide variety of loads.

ALLOY STEEL BRAKE FLANGES have larger braking area . . . bolted to drum for easy replacement.

GET COMPLETE SPECS ON THE JOY "510". Write *Joy Manufacturing Company, Oil Field Drill Division, P.O. Box 7204, Inwood Station, Dallas, Texas.* In Canada: *Joy Manufacturing Company (Canada) Limited, Galt, Ontario.*

Write for FREE Bulletin 128-31

Consult a Joy Engineer

For PORTABLE ROTARY DRILLS, AIR COMPRESSORS, GAS GATHERING COMPRESSORS, PORTABLE LIGHTING LINES

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JOY

WORLD'S LARGEST MANUFACTURER OF CORE DRILLS AND PORTABLE OIL FIELD DRILL RIGS

No Other Hose Is Safer To Use... Longer Lasting!

New engineering improvements make Ray-Man CBL Rotary Hose better than ever . . . the safest, longest lasting hose you can use on your rotary rigs. Manhattan's method for precision winding high-tensile steel cable wire reinforcement gives Ray-Man CBL a degree of strength *plus* flexibility never before possible. This hose has the added stability to hold steady in the derrick, to resist pulsation and whipping under the pressures of deep drilling. The flexibility of the cable wire minimizes the dangers of permanent damage if the hose is sharply kinked or accidentally crushed.

Ray-Man CBL Rotary Hose is unequalled for safety. It is blow-out proof . . . thanks to Manhattan's streamlined, built-in coupling. Designed without protruding lugs or flanges that cause fouling on the job, this coupling features the special leak proof "Lip-Lok" that tightens under pressure to prevent dangerous—and costly—blow-outs.

These features, plus Manhattan's oil-proof tube which permits drilling-in with oil or oil-base mud, add up to easier handling and longer, trouble-free service at less cost for all methods of drilling. Write for Bulletin #6743 for details of how you can get the highest safety factor, longest life and lowest cost per foot drilled . . . "More Use per Dollar" . . . with Ray-Man CBL Rotary Hose.

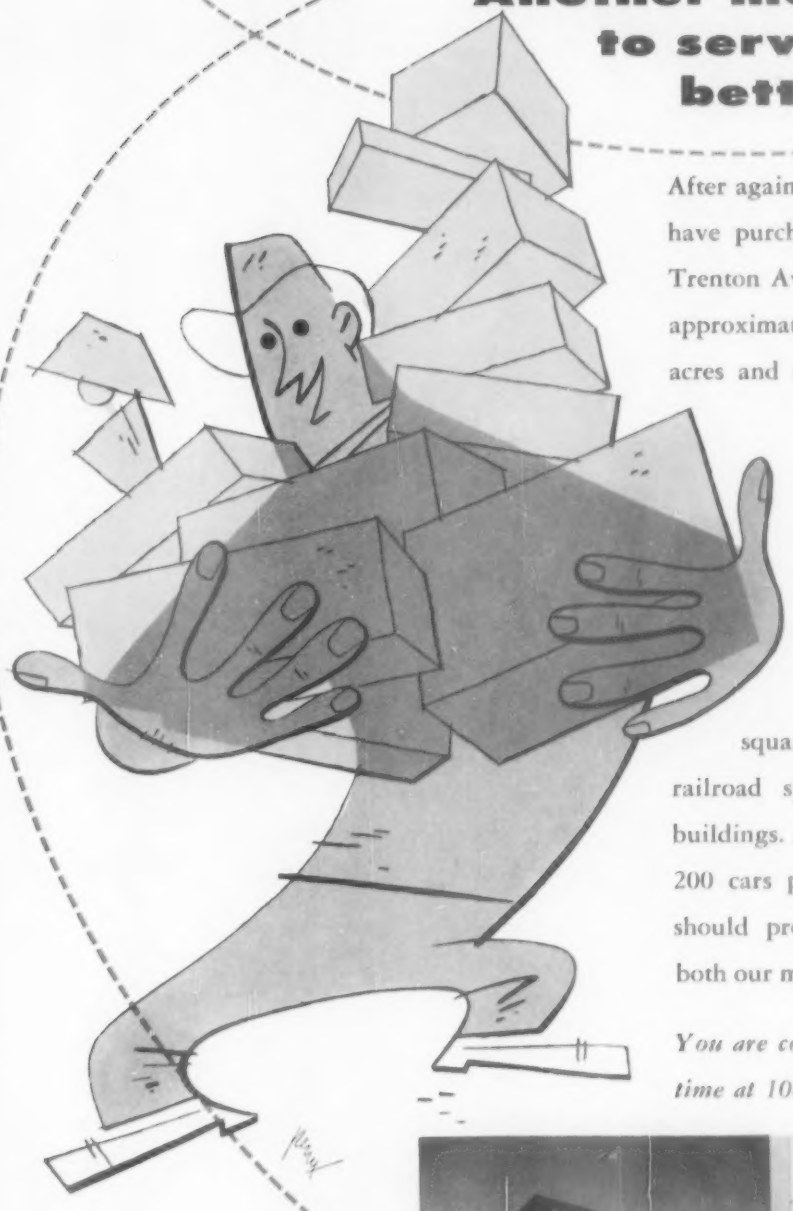
RM 615

MANHATTAN RUBBER DIVISION—PASSAIC, NEW JERSEY

RAYBESTOS-MANHATTAN, INC.

Other R/M products include: Industrial Rubber • Fan Belts • Radiator Hose • Brake Linings • Brake Blocks • Clutch Facings Asbestos Textiles • Packings • Engineered Plastic, and Sintered Metal Products • Laundry Pads and Covers • Bowling Balls

Another move, to serve YOU better . . .



After again outgrowing our quarters, we have purchased property at 108 North Trenton Avenue, in Tulsa, consisting of approximately three and one quarter acres and several buildings. The main office building contains in excess of 14,000 square feet. Our rapidly expanding engineering department will be housed in a separate two story building with about 37,000 square feet. We have our own railroad spur and equipment storage buildings. A paved parking area for about 200 cars permits offstreet parking and should prove a great convenience for both our many visitors and our employees.

You are cordially invited to visit us any time at 108 North Trenton Avenue.

Our telephone (LUther 4-3461) and Post Office Box (1558) numbers remain the same.

TRECo

A DIVISION of VITRO CORPORATION of AMERICA

The REFINERY ENGINEERING Company

NEW YORK TULSA TORONTO

If you're considering deeper or higher pressure wells—

TIMKEN® SEAMLESS STEEL TUBING GIVES YOU INTERNAL PRESSURE STRENGTH TO 15,000 PSI— YIELD STRENGTH TO 125,000 PSI

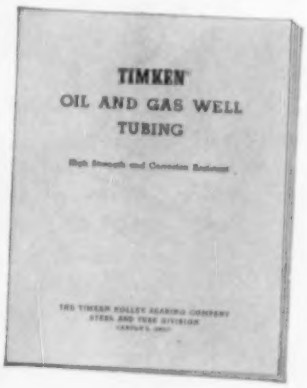
THE WELL HASN'T YET BEEN DRILLED that can apply the pressure Timken® oil and gas well steel tubing can take. To meet the trend to deeper wells and higher pressures, here's tubing that can take internal pressures up to 15,000 psi.

And Timken seamless steel tubing goes beyond the stiffest specifications of the American Petroleum Institute. The highest API specification—5A—calls for a yield strength of 105,000 psi. We offer you up to 125,000 psi yield strength, with maximum uniformity of properties and quality.

Timken seamless steel tubing is available in a variety of sizes and analyses. Some are specially selected for corrosion resistance. All provide high ductility.

Into every foot of Timken seamless steel tubing goes 24 years of experience in pioneering high pressure seamless steel tubing applications for the petroleum and other industries. Several extremely deep oil and gas wells are now using Timken seamless tubing with very satisfactory results.

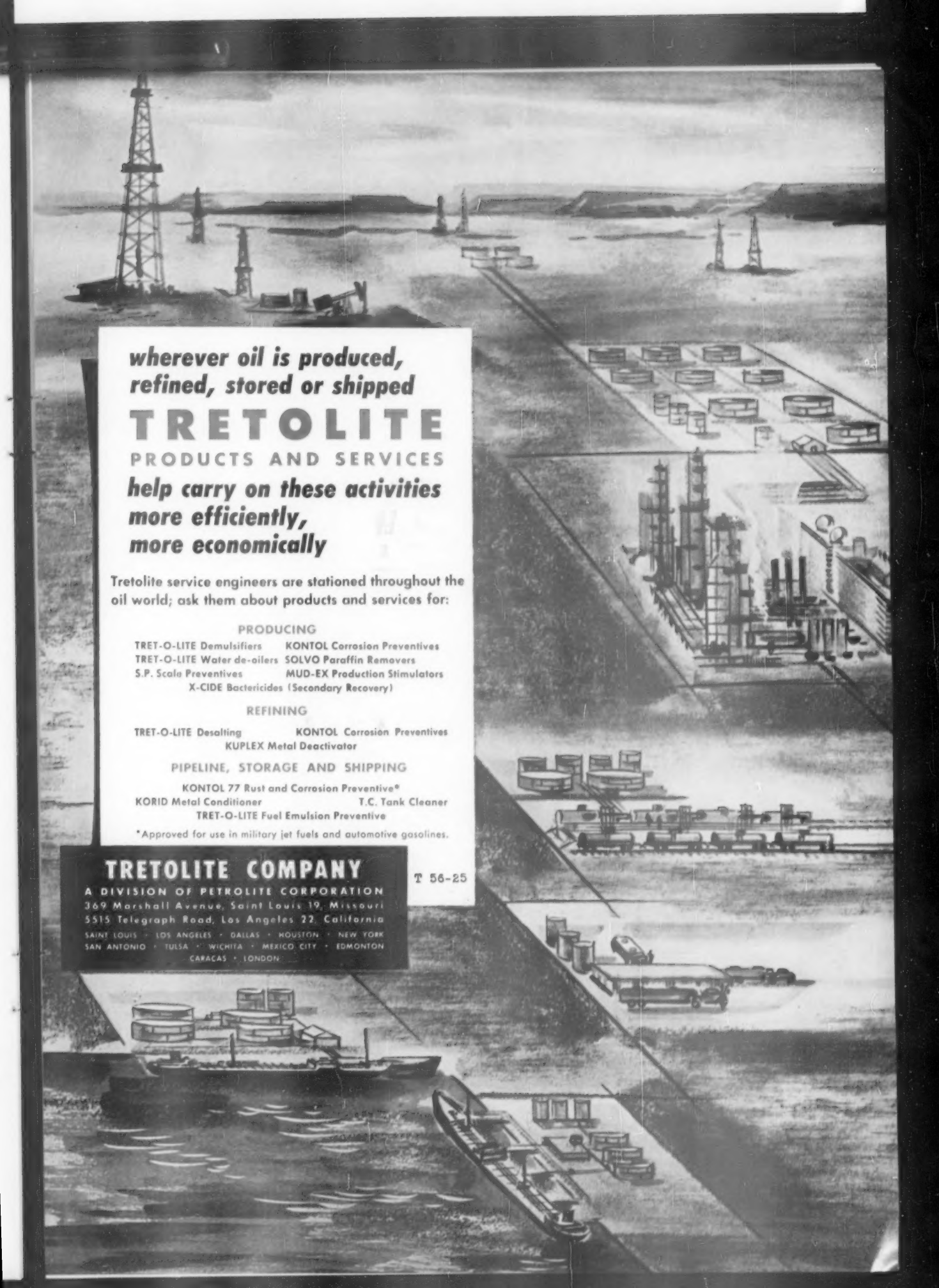
FREE ENGINEERING STUDY
A recent study by Timken Company metallurgists reviews the properties of various alloys and their application to oil field operation. Get your free copy today of "Timken Oil and Gas Well Tubing". Write: The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable: "TIMROSCO".



TIMKEN *Fine Alloy* STEEL

TRADE-MARK REG. U.S. PAT. OFF.

SPECIALISTS IN FINE ALLOY STEELS, GRAPHITIC TOOL STEELS AND SEAMLESS STEEL TUBING



wherever oil is produced, refined, stored or shipped

TRETOLITE

PRODUCTS AND SERVICES

help carry on these activities more efficiently, more economically

Tretolite service engineers are stationed throughout the oil world; ask them about products and services for:

PRODUCING

TRET-O-LITE Demulsifiers
TRET-O-LITE Water de-oilers
S.P. Scale Preventives
KONTOL Corrosion Preventives
SOLVO Paraffin Removers
MUD-EX Production Stimulators
X-CIDE Bactericides (Secondary Recovery)

REFINING

TRET-O-LITE Desalting
KONTOL Corrosion Preventives
KUPLEX Metal Deactivator

PIPELINE, STORAGE AND SHIPPING

KONTOL 77 Rust and Corrosion Preventive*
KORID Metal Conditioner
T.C. Tank Cleaner
TRET-O-LITE Fuel Emulsion Preventive

*Approved for use in military jet fuels and automotive gasolines.

TRETOLITE COMPANY
A DIVISION OF PETROLITE CORPORATION
369 Marshall Avenue, Saint Louis 19, Missouri
5515 Telegraph Road, Los Angeles 22, California
SAINT LOUIS • LOS ANGELES • DALLAS • HOUSTON • NEW YORK
SAN ANTONIO • TULSA • WICHITA • MEXICO CITY • EDMONTON
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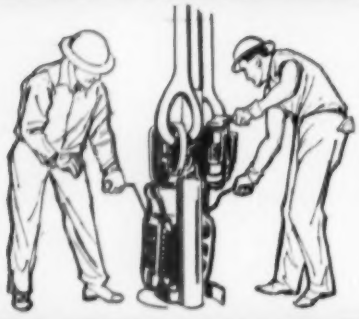
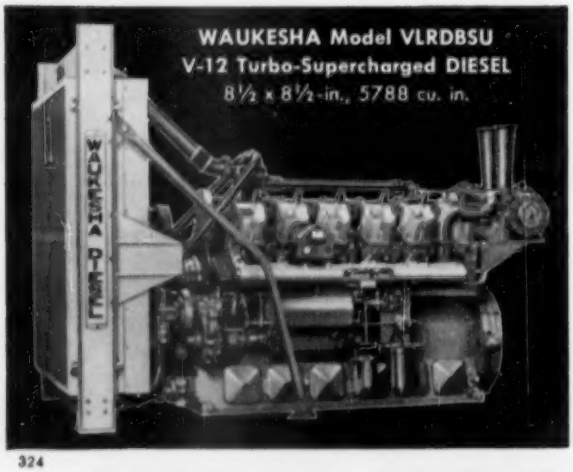
T 56-25



Brewster-Bartle Drilling Co. Inc. use WAUKESHAS on "Trinity Bay" inland barge on South Louisiana coast



● Three VLRDBSU Waukeshas do the drilling and pumping here. They're big ... and equipped with exhaust-driven dual turbo-chargers for extra power that's extra-smooth. Rugged for heavy duty, but compact ... and yet simple in design for complete reliability with high fuel economy and low upkeep. They're 12-cylinder, 60-degree vee, four-cycle, 5788 cu. in. full Diesels with counterbalanced crankshafts. Send for Bulletin 1663.

For lighting and auxiliary power there are two Waukesha WAKDB 100 KW Enginators. These accurately balanced, conservatively rated Waukesha Diesel engine-driven generator combinations supply a smooth, steady flow of power for continuous duty. Other Waukesha Enginators in capacities from 600 to 50 KW. Send for Bulletins.

324

WAUKESHA

WAUKESHA MOTOR COMPANY, WAUKESHA, WISCONSIN • NEW YORK • TULSA • LOS ANGELES

"Be sure those are *WECO* UNIONS"

It pays to ask for WECO by name at your supply store. For only then are you sure of getting the finest union made for perfect sealing and service.

Only then do you get the benefits of WECO'S precision ball and cone seat that holds a positive, leak-proof seal. You get fast, easy make-up and break-out — without damage to seat or threads. You get a wing nut that can take hammering without distortion . . . heavier wall sections in the sub ends that can take the toughest treatment on hook-up after hook-up.

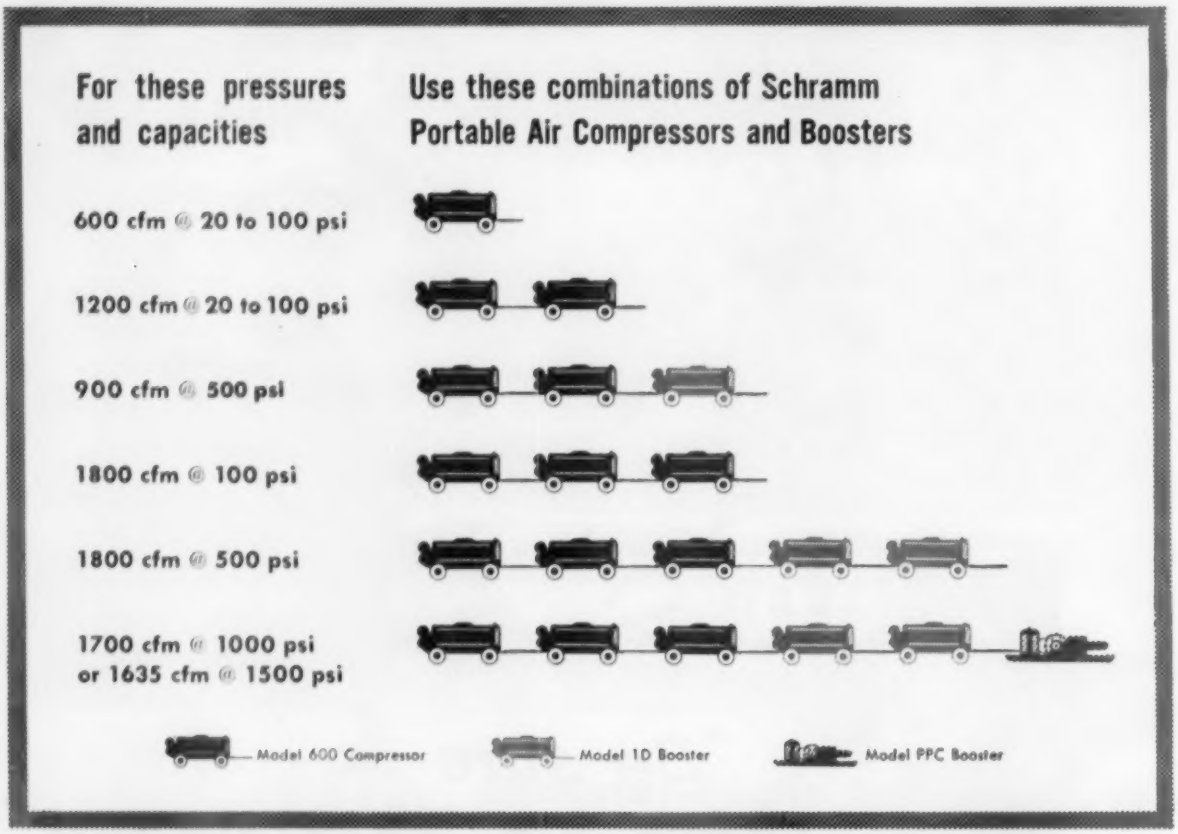
Next time you get unions from your supply store — be sure to ask for WECO — and get the finest unions made.

U-14-56

WECO

WELL EQUIPMENT MFG. CORP.
HOUSTON, TEXAS

Division of CHIKSAN COMPANY *a subsidiary of*
FOOD MACHINERY AND CHEMICAL CORPORATION


For these pressures and capacities
Use these combinations of Schramm Portable Air Compressors and Boosters
600 cfm @ 20 to 100 psi
1200 cfm @ 20 to 100 psi
900 cfm @ 500 psi
1800 cfm @ 100 psi
1800 cfm @ 500 psi
1700 cfm @ 1000 psi
or 1635 cfm @ 1500 psi
Model 600 Compressor
Model 1D Booster
Model PPC Booster

Portable booster system...flexible as you wish

Gives any volume of air up to 1800 cfm at pressures up to 1500 psi

When you need compressed air at higher than 125 psi—for drilling oil or gas wells, or testing pipe lines—get it at lowest cost with this flexible combination of Schramm Portable Compressors and Boosters. By varying the combination of units, you get desired volumes and pressures—from 125 cfm at 100 psi up to 1800 cfm at 1500 psi.

Each of the three Model 600 Schramm Compressors shown delivers up to 600 cfm at pressures up to 125 psi. If you need more pressure, use one or two of the boosters. Two compressors (at slow speed) and one booster deliver 900 cfm at up to 500 psi. And all three compressors (running at rated speed) and both boosters give up to 1800 cfm at up to 1500 psi. You get exactly what you need for the specific job.

Compressed air drilling of oil and gas wells becomes more practical than ever with this flexible, economical system of portable units. Schramm combinations increase penetration rates by 40% to 237% over conventional rigs. Holes are cleaner and straighter. Mud cake is eliminated. Bits last up to 348% longer. Cuttings can be examined continuously. Core recovery is excellent. Cement requirements are lower. And the use of air, instead of mud, eliminates cost of water and chemical mud. Also, you have no lost-circulation problems when you drill with air.

If you have never used the Schramm method of drilling with air, your drilling costs may be as much as 50% higher than they should be. Start cutting them now; get full information on Schramm Portable Compressor-and-Booster Combinations. Free data sheet shows nine combinations available. Send for your copy and ask for full details of rotary rock drilling with Schramm Portable Compressors and Boosters. No obligation.

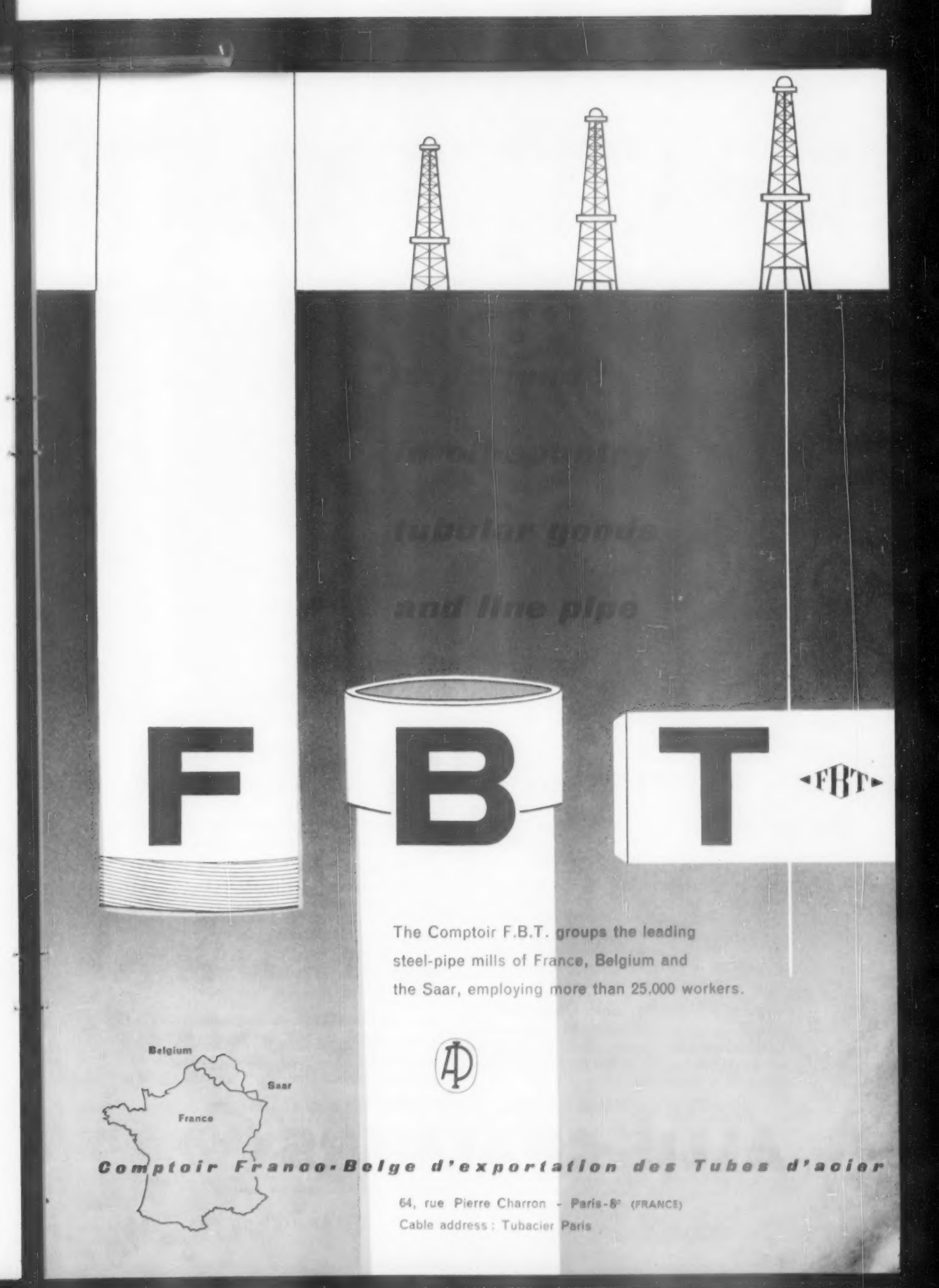
Schramm Portable Compressors and Boosters are easy to install. Simply wheel them into position, connect to manifold and begin drilling without further adjustment. All Schramm Boosters and Model 600 Compressors are powered by the same engine, either the International Harvester UD-1091 diesel or U-1091 gas engine. Result: fewer service parts, lowest maintenance.

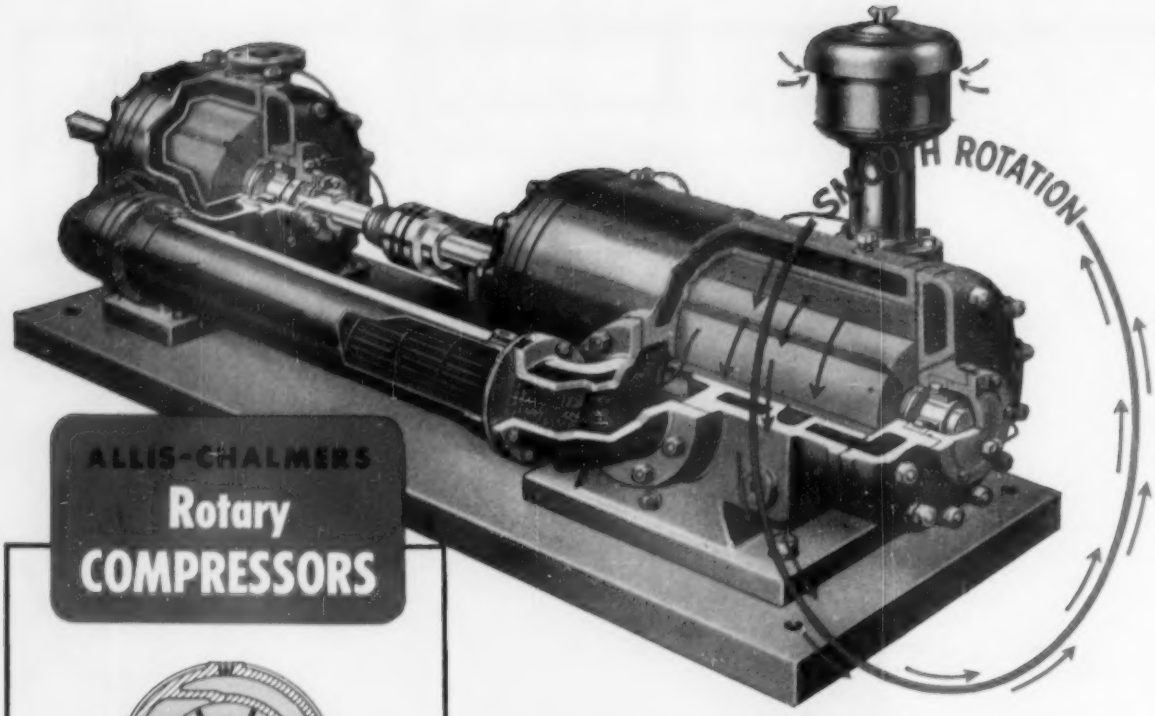
Your local Schramm Dealer is listed in the Yellow Pages of your telephone directory.

Schramm, Inc.

MANUFACTURERS OF AIR COMPRESSORS

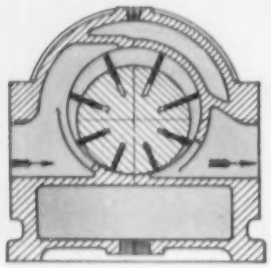
630 North Garfield Ave. West Chester, Pa.


F
B
T
FBT
The Comptoir F.B.T. groups the leading
steel-pipe mills of France, Belgium and
the Saar, employing more than 25.000 workers.
Belgium
Saar
France
Comptoir Franco-Belge d'exportation des Tubes d'acier
64, rue Pierre Charron - Paris-8e (FRANCE)
Cable address : Tubacier Paris



ALLIS-CHALMERS

Rotary COMPRESSORS



How Ro-Flo units operate: Centrifugal force moves vanes to outside wall to form air chamber.

Smooth-running Ro-Flo Compressors cut vibration, and provide...

Constant Efficiency

YEAR after year there is no change in the efficiency of a *Ro-Flo* compressor.

Efficiency always remains uniformly high even if parts wear. Here's the reason:

During operation the sliding vanes of the rotor (see cross section above) press against the cylinder wall to form air cells. Even if these vanes wear, the centrifugal force holds them in contact with the cylinder wall so that the air cell never changes and efficiency and air flow remain constant.

Rotary Means Smooth Operation

Smooth rotation cuts vibration ... eliminates need for heavy foundations. Small *Ro-Flo* units can be bolted directly to the floor. Large units need only a simple slab.

Maintenance is low. There is no wear and tear on compressors from shock and vibration ... no pistons and valves.

A Type and Size for Every Need

Single-stage units for pressures to 50 pounds gauge, and volumes from 42 to 3245 cfm. Two-stage units for 250 to 1800 cfm at pressures from 60 to 125 pounds gauge.

Single and two-stage vacuum pumps for vacuums to 0.3 inch mercury absolute from 22 to 5950 cfm.

GET INFORMATION — Call your nearest A-C office or write for bulletins 16B8244 (2-stage) and 16B8126 (1-stage). Allis-Chalmers, Industrial Equipment Division, Milwaukee 1, Wis.

Ro-Flo is an Allis-Chalmers trademark.

ALLIS-CHALMERS

A-5134

NOW . . . IN STOCK . . . NOT SPECIALS

MIDWEST REDUCING ELBOWS UP TO 30″

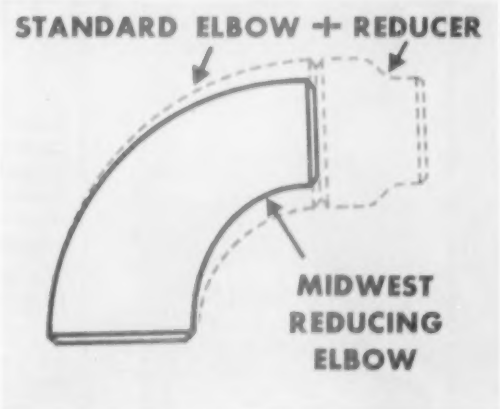
Your demand for Midwest Reducing Elbows has dictated our decision to make them STOCK items in all pipe sizes to 30″ OD and all reductions to one-half the nominal pipe size. We now have a modest stock of practically all sizes in standard and extra heavy weight, and this stock is being added to as rapidly as possible.

Midwest Reducing Elbows are also made as "specials" in heavy wall and/or any weldable alloy. The fact that our raw material is plate instead of tubing greatly increases our range of wall thicknesses and types of materials . . . it also improves the delivery.

Note the significant advantages of Midwest Reducing Elbows listed below. For further information, get in touch with the nearest Midwest Distributor or write us for Catalog 54.

✓ CHECK THESE ADVANTAGES OF MIDWEST REDUCING ELBOWS

- ✓ Save more than ⅓ of the welding required by standard elbows and reducers.
- ✓ Reduce turbulance and pressure drop because of gradual taper.
- ✓ Fit into smaller space than straight elbows and reducers.
- ✓ Greater piping design opportunities . . . easily adaptable for making special reducing fittings such as "bull-head" tees and back-outlet elbows.
- ✓ Improve appearance of piping.
- ✓ Available from stock in sizes to 30″ OD. (Heavy walls and alloys on special order.)



MIDWEST PIPING COMPANY, INC.

Main Office: 1450 South Second St., St. Louis 4, Mo.

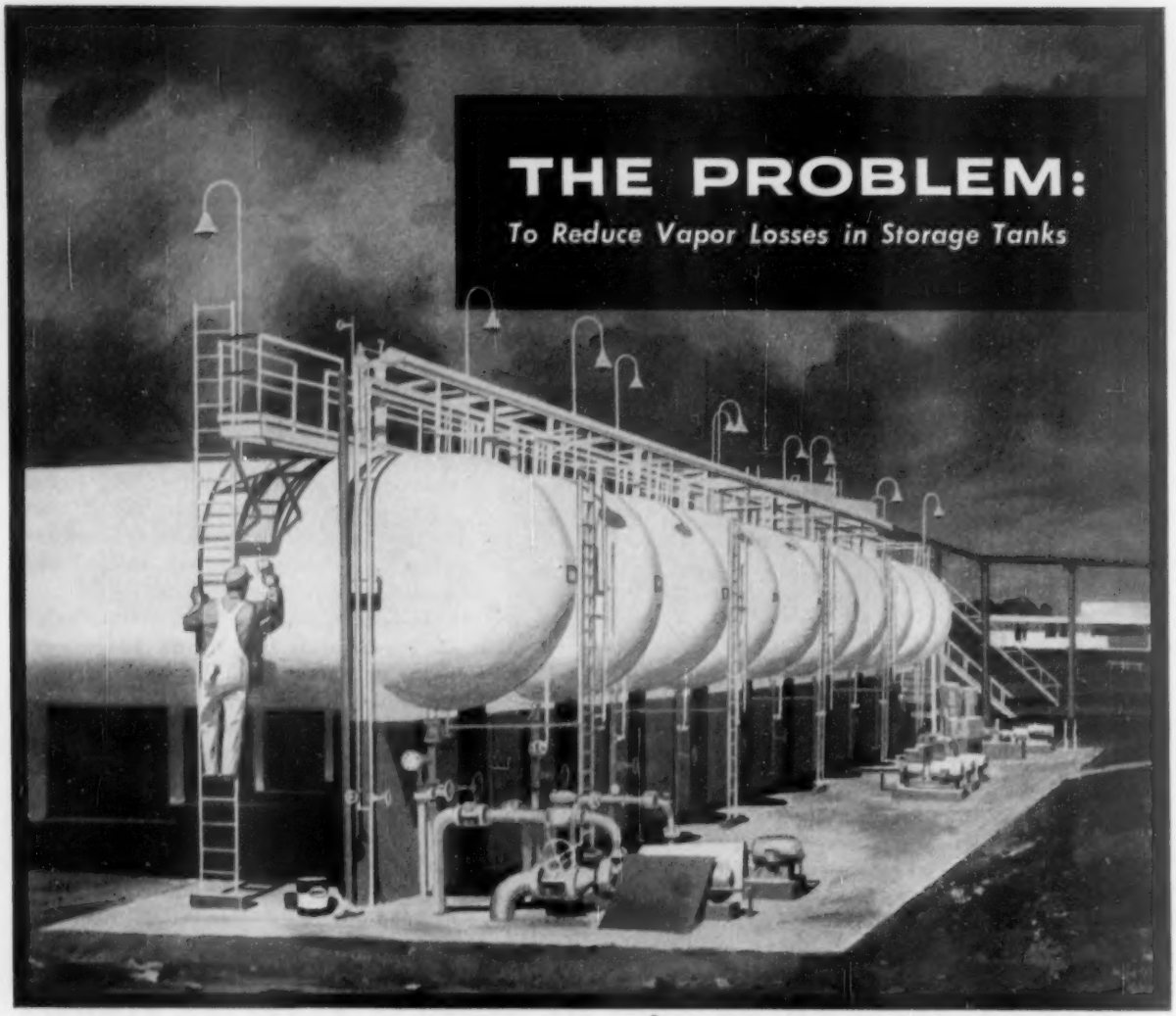
PLANTS: ST. LOUIS, CLIFTON, N. J. and LOS ANGELES

SALES OFFICES:

ASHEVILLE (BOX 446, SKYLAND, N.C.)
BOSTON 27—426 FIRST ST.
CHICAGO 3—79 WEST MONROE ST.
CLEVELAND 14—616 ST. CLAIR AVE.
HOUSTON 2—1213 CAPITOL AVE.
LOS ANGELES 33—520 ANDERSON ST.
MIAMI 34—2103 LE JEUNE RD.
NEW YORK 7—50 CHURCH ST.
ONEIDA, N.Y.—282 NORTH MAIN ST.
SAN FRANCISCO 11—420 MARKET ST.

STOCKING DISTRIBUTORS IN PRINCIPAL CITIES

7662



THE SOLUTION

Humble's Light and Heat Reflective
Exterior White Enamel 460

The light and heat reflective properties of Humble's Exterior White Enamel 460 effectively reduce vapor losses from such highly volatile products as LP Gas and gasoline by reducing interior temperatures in storage tanks. When it is applied over a Rust-Ban priming system, you also get superior protection against extreme weathering and corrosive fumes, plus good color and gloss retention.

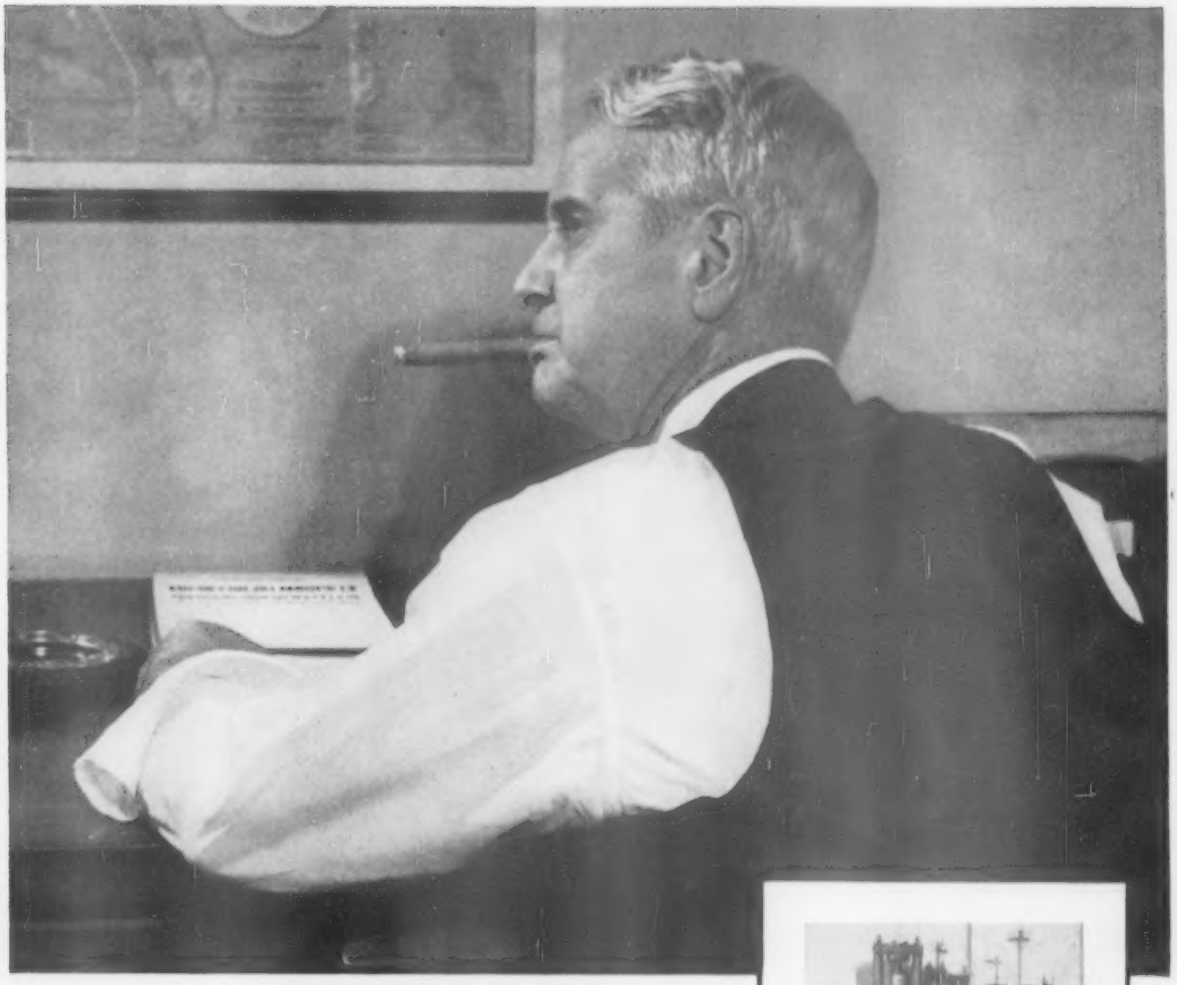
Humble produces a complete line of protective coatings—Rust-Bans, paints and enamels, each designed for a specific task.

For more information on Humble protective coatings, see your nearest Humble wholesale plant in Texas and New Mexico, or write or phone:

Technical Service,
Sales Department,
Humble Oil & Refining Company,
P. O. Box 2180, Houston 1, Texas.

HUMBLE

HUMBLE OIL & REFINING COMPANY



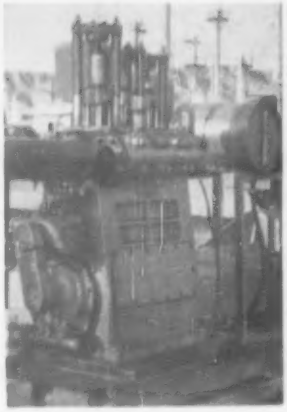
"And I say it has to be an ALDRICH PUMP!"

Continuous, heavy duty pumping operations, often at high pressures, demand the complete reliability and freedom from maintenance found only in an Aldrich Pump. Top performance under these conditions has earned Aldrich its reputation for building pumps of highest quality and dependability.

The tougher the job . . . the more important it becomes to take advantage of our wide experience in providing the petroleum industry with pumps for water flood, pipeline, gasoline plant, hydrocarbon injection or petrochemical service.

In the less critical jobs, too . . . it makes sense to call Aldrich. The simplicity of the Aldrich Direct Flow design, with fluid-end sectionalization and automatically controlled delivery, offers substantial economies in both operation and maintenance.

A copy of our new condensed catalog, showing the line of Aldrich Pumps is yours for the asking. Write for Data Sheet 100. The Aldrich Pump Company, 9 Gordon Street, Allentown, Pa.



Shown above is one of a number of Aldrich 5" stroke, Triplex Pumps installed at a major west coast water injection project. These pumps are currently handling 35,000 bbl daily at injection pressures of 1,000 psi.

THE ALDRICH PUMP COMPANY

Field parts stock is available in Carmi, Ill., Charleston, W. Va., Houston, Tex., Los Angeles, Calif., Odessa, Tex., Tulsa, Okla.

GEARED

CLARK

CLARK BROS. CO., Olean, New York—Gas turbines, engines, and reciprocating, centrifugal and axial flow compressors—gas, steam, electric and diesel driven.

IDECO

DRESSER-IDECO COMPANY, Columbus, Ohio — Radio and television broadcasting towers, steel buildings, aircraft hangars, electric power substations.

DRESSER
MANUFACTURING DIVISION

DRESSER MANUFACTURING DIVISION, Bradford, Pa.—Pipe line couplings, pipe repair sleeves and clamps, weldments, forgings, welding fittings, flanges, rings.

*Trademark registered

GUIBERSON

THE GUIBERSON CORPORATION, Dallas, Tex. — Oil tools: packers, anchors, workover equipment—drilling heads, blowout preventers, tubing blocks, hooks, swivels, kellys, savers, unions. Gas lift equipment. Molded rubber products.

IDECO®

IDECO, Dallas, Tex.—Hydrair* and Power Rigs; Full-View* Masts; Substructures; Single, Dual and Drive-In Rambler Rigs; Blocks, Swivels, Rotaries; Mud Pumps; Petroleum Equipment and Supplies.

LANE WELLS COMPANY

LANE-WELLS CO., Los Angeles, Calif., Houston, Tex., Oklahoma City, Okla. — Electric and Radioactivity Well Logging, Koneshot* perforating and bullet perforating, packers and bridging plugs.

Magcobar®

MAGNET COVE BARIUM CORP., Houston, Tex.—Magcobar* and Magcogel* drilling muds and other specialized oil well drilling fluids and chemicals.

PACIFIC

PACIFIC PUMPS, INC., Huntington Park, Calif.—Centrifugal pumps for refineries, power stations, pipelines, and chemical plants; plunger pumps for oilwells.

ROOTS-CONNERSVILLE

ROOTS-CONNERSVILLE BLOWER DIVISION, Connersville, Ind.—Rotary positive blowers, gas pumps, centrifugal blowers, exhausters, vacuum pumps, and positive displacement meters.

Security

SECURITY ENGINEERING DIVISION, Dallas, Tex., Whittier, Calif.—Rock bits, reamer rock bits and hole openers; reamers, casing scrapers and Neo-Red rubber stabilizers.

SIE

SOUTHWESTERN INDUSTRIAL ELECTRONICS, Houston, Tex. — Seismograph systems and instruments—electronic, electromechanical. Computers—analog and digital; recording systems. Special transformers, reactors.

AS A STANDARD OF COMPARISON THE WORLD OVER!

The Dresser *Plus* + is more than a catch phrase. It's the personification of the basic business operating philosophy of independently-managed Dresser companies. The Dresser *Plus* + is another way of saying "teamwork." It's your assurance of a reputable world-wide source of equipment and technical services for the oil, gas, chemical and electronic industries.

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As needed, the resources of the Dresser companies can be meshed together in a smoothly operating mechanism. In such cases, the specialized experience and facilities of each division are combined to bring about unified action. This Dresser *Plus* + service is readily available from Dresser offices and representatives in the United States and over 100 foreign locations.

Geared together by Dresser Industries, Inc., these many diversified though allied facilities assure highly successful performance...make Dresser products and technical services for the oil, gas, chemical and electronic industries the standard of comparison the world over. DRESSER INDUSTRIES, INC., home office in the United States, Republic National Bank Building, Dallas 21, Texas.

TOMORROW'S PROGRESS PLANNED TODAY

TO MAINTAIN CLOSE PERSONAL CONTACT WITH OUR CUSTOMERS, DRESSER OPERATES WORLD WIDE.	CLARK BROS. CO. London, England	CLARK COMPRESSOR CO., LTD. Calgary, Alberta, Canada	CLARK-ITALY, S.p.A. Rome and Milan, Italy	CLARK BROS. PAN AMERICAN CO. DIVISION OF DRESSER INTERNATIONAL, INC. Buenos Aires, Argentina; Mexico City, D.F. and Caracas, Venezuela
DRESSER A.G. Zurich, Switzerland Caracas, Venezuela	DRESSER MANUFACTURING COMPANY, LIMITED Toronto, Ontario, Canada	DRESSER MANUFACTURES (ENGLAND) LIMITED London, England	IDECO DIVISION, DRESSER INTERNATIONAL, INC. Mexico City, D.F., Caracas, Venezuela and Buenos Aires, Argentina	LANE-WELLS CANADIAN COMPANY Edmonton, Alberta, Canada
MAGNET COVE BARIUM CORPORATION, LTD. Calgary, Alberta, Canada	MAGCOBAR DE MEXICO, S.A. Monterrey, N.L., Mexico	MAGCOBAR DE VENEZUELA, C.A. Puerto La Cruz, Venezuela	PACIFIC PUMPS OF CANADA, LTD. Edmonton, Alberta, Canada	PETRO-TECH SERVICE, C.A. Caracas, Venezuela
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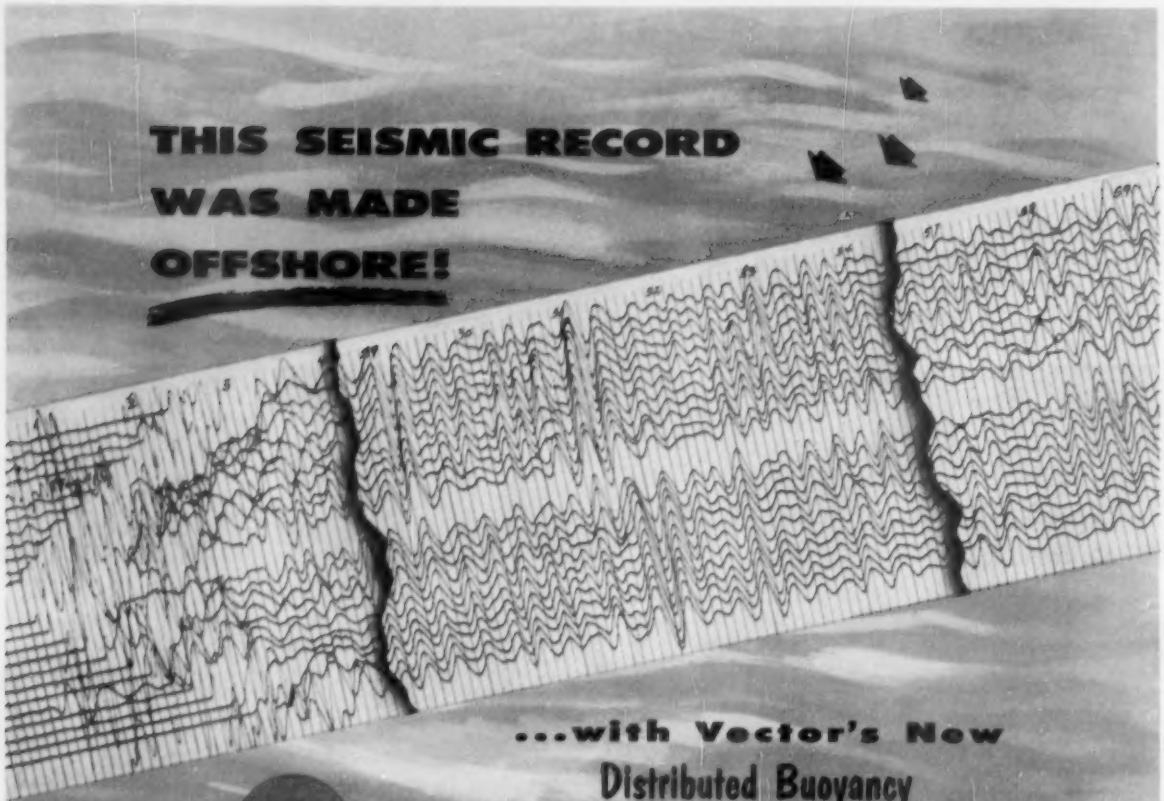
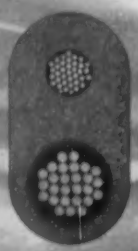
THIS SEISMIC RECORD WAS MADE OFFSHORE!



...with Vector's New Distributed Buoyancy Floating Cables



Vector Distributed Buoyancy Floating Cable is continuously extruded with a tough resilient jacket of almost indestructible buoyant polyethylene. The cable assembly and stress core are permanently bonded in the buoyant material.

The cable conductors are nylon insulated and jacketed in moisture proof neoprene which is oil filled to prevent water entry. Another example showing how Vector products are: *"Manufactured to Meet the Demands of Seismic Exploration"*

The low noise level seismogram pictured was recorded 15 miles offshore at a water depth of 40 feet. The new Vector floating cable used pressure sensitive geophones which were automatically positioned 10 feet below the surface when towing force was released.

Vector Distributed Buoyancy Cables have many other features that improve results and lower costs of offshore oil exploration — reduction of recorded noise level — elimination of cable damage and recording problems arising from bottom conditions — multiple geophones easily used. Other Distributed Buoyancy Cables are equally valuable in shallow water operations. Contact Vector for full information.

Vector MANUFACTURING COMPANY
5616 LAWNDALE AVE. • HOUSTON 23, TEXAS

Pipeline laid over rugged terrain.

Pipeline ditch cuts through shale and rock.

Cleaning machine and primer application.

NO-OX-ID and wrapper applied by Traveliner.

NO-OX-ID COMBINATIONS FOR LONG-TERM PIPELINE PROTECTION

Before you specify the protection you want on your next pipeline job, check into the advantages of Dearborn's NO-OX-ID Coating Combinations. They're your assurance of dependable, long-term protection. Your Dearborn Pipeline Engineer, a specialist in corrosion control, will consult with you and recommend the combination best suited to your requirements.

Investigate Dearborn's New Pipeline Enamel 240

The NEW Dearborn Pipeline Enamel 240 fills the need for a truly economical, long-lasting pipe coating. Made from selected asphaltic crudes, 240 is unusually flexible over a wide temperature range. It features all desirable characteristics with respect to ease of application, dielectric strength, flexibility, penetration, electrical resistance, and minimum moisture absorption. In actual tests, sample strips of 240 have been bent double at 50° F. over a one-inch mandrel without fracture.

ADVANTAGES OF NO-OX-ID PROTECTIVE COATINGS

- ★ Applied hot or cold
- ★ By hand, by Traveliner or at the mill
- ★ No noxious fumes
- ★ Requires less equipment
- ★ Lasts longer

it pays to specify

Dearborn NO-OX-ID®

For Long-Term Pipeline Protection

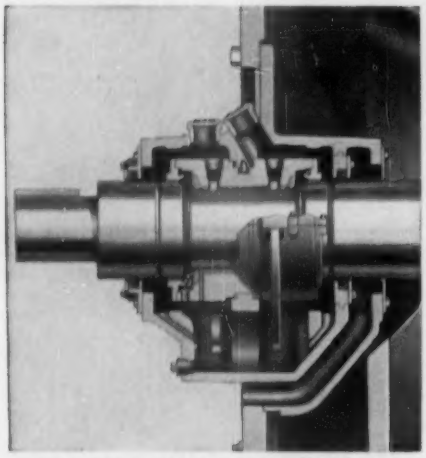
WRITE FOR BULLETIN

"Protecting Underground Pipe from Corrosion with NO-OX-ID and NO-OX-IDized Wrappers" tells the story. Your copy is ready upon request.

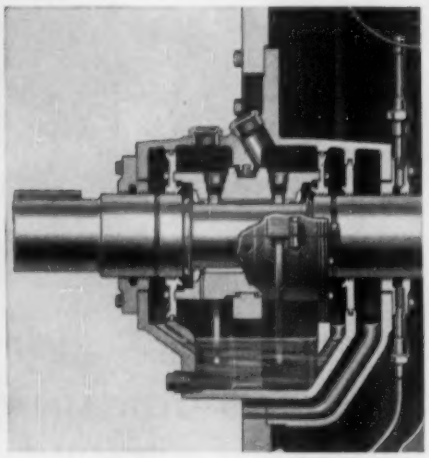
DEARBORN CHEMICAL COMPANY • Merchandise Mart Plaza • Chicago 54, Ill.

NEW Bearing Design Means Better Motor Performance

Allis-Chalmers capsule-type sleeve bearings now perfected for complete motor line



Standard capsule-type sleeve bearing



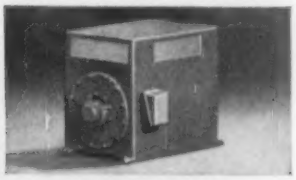
High speed capsule-type sleeve bearing

A new feature—an improved capsule-type bearing design—has been added to the Allis-Chalmers complete line of large end-shield bearing motors. This new bearing will give you better motor service, simplified maintenance and longer motor life through features like:

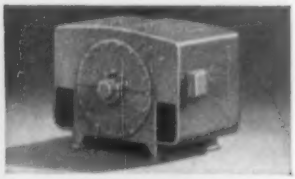
- Dust-tight, leakproof enclosure protects bearing from dirt, dust or abrasive materials.
- Venting system prevents oil leakage — keeps oil and vapor from getting into motor enclosure.
- Dual oil-rings insure bearing surface lubrication — either ring can adequately lubricate bearing.
- Split end-shield gives easy accessibility to winding and air gap — without disturbing capsule or bearing alignment.

Drip-proof or splash-proof cage motor

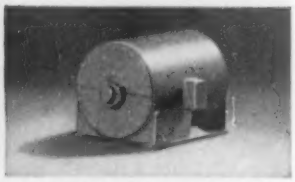
Synchronous or wound-rotor motor



High speed cage motor

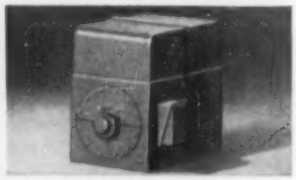


Weather-protected motor



Totally-enclosed fan-cooled motor

Totally-enclosed forced-ventilated motor



Water-cooled or inert-gas-filled motor

Capsule-type bearings are standard on these Allis-Chalmers motors.

You get MORE from Allis-Chalmers motors

More design and construction features — more application help. For complete information, contact your nearby A-C office or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

ALLIS-CHALMERS

A-5032

The combination of durability, deep penetrating action and fast cutting speeds makes CP

Three Cone Rock Bits the favorite of drilling rig operators everywhere. Available in seven different types, there's a CP bit for every kind of formation from soft to exceedingly hard and abrasive. For more details write Oil Tool Division, Chicago Pneumatic Tool Company, 5000 U.S. Highway 81 So., Fort Worth, Texas.

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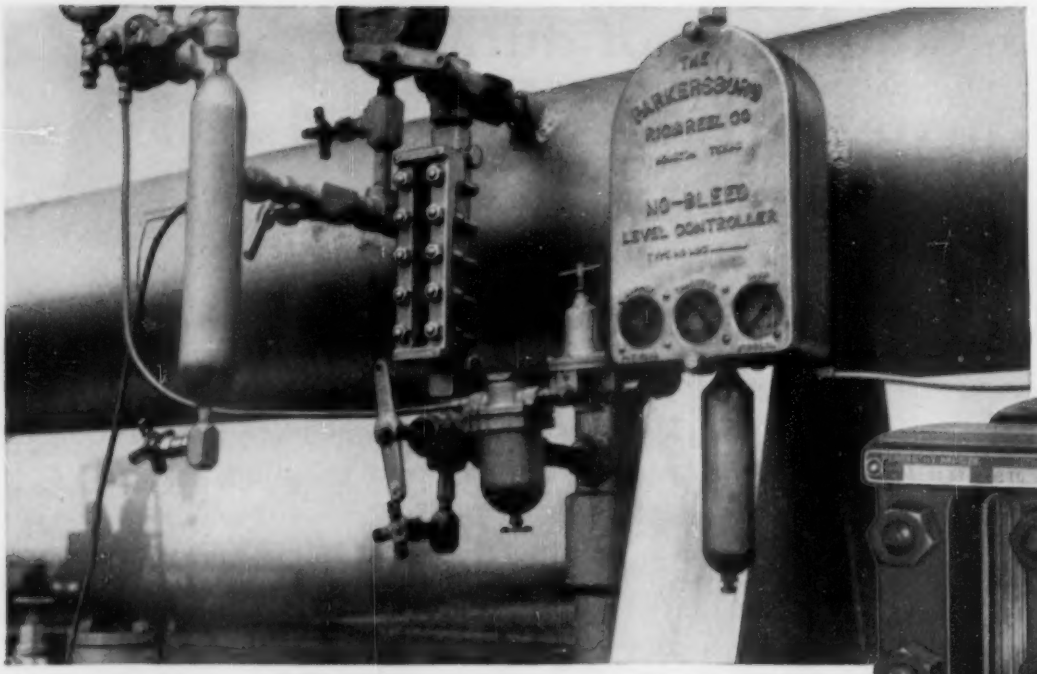

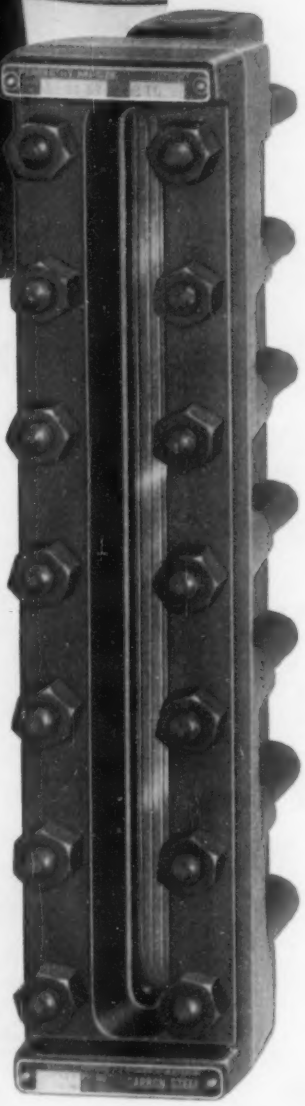

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This PARKERSBURG single-stage horizontal separator is used to separate oil well fluids into liquids and gas. It is only one in the famous line of PARKERSBURG separators equipped with PENBERTHY gages.

To closely regulate interface surfaces, a special NO-BLEED level controller (above) assures quick dump valve opening and controls the amount of oil discharged.

For DOUBLE PROTECTION, a PENBERTHY liquid-level gage provides instant visual proof that interface levels are properly maintained.

Similar applications are found throughout the refinery and petro-chemical industries where accurate liquid-level readings are vitally important.

To provide the kind of service these industries require, PENBERTHY gages are designed and tested for rugged strength and accurate performance. The exclusive "raised face" glass reduces internal stresses assuring longer glass-life and a minimum of maintenance.

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When you buy *Pitt Chem,* you buy assured pipeline protection with every drum, because *Pitt Chem* Coal Tar Coatings are manufactured to published specifications. ● Call on a *Pitt Chem* man to help you plan your next pipeline protection job. He's fully equipped to give you valuable technical assistance . . . and to guide you to long-run protection economies.

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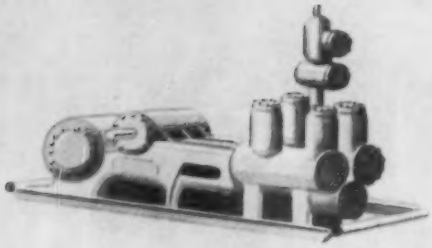
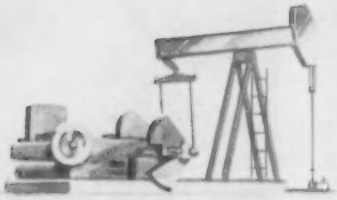
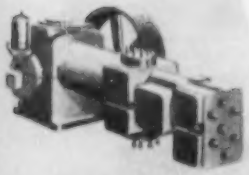


Our business is YOUR business



The stores of Wilson Supply Company are stocked with the items you as oilmen desire, and our employees are proud to work for you 'round the clock. Only in helping you can we help ourselves.



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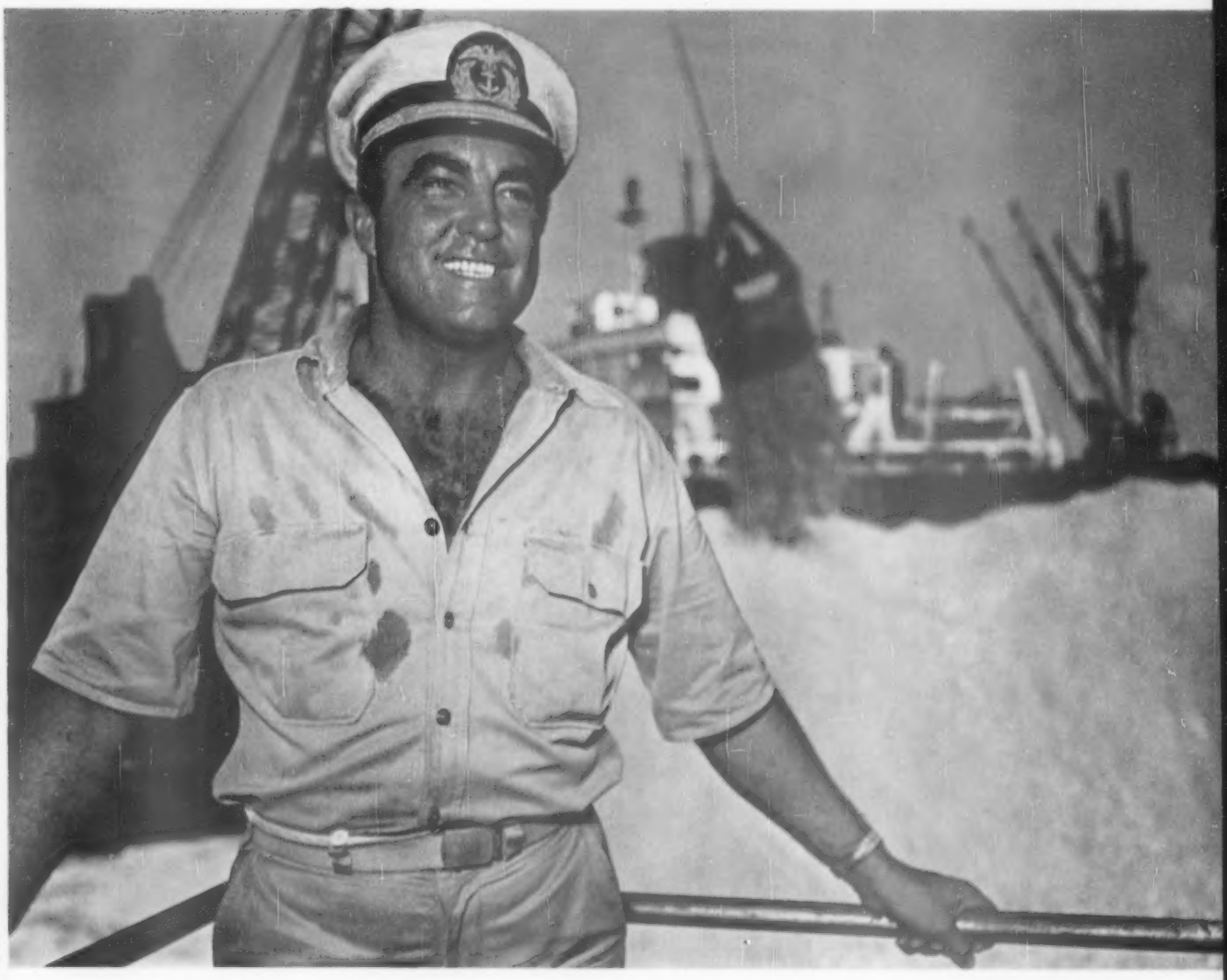
It takes a complete team to keep dependable drilling mud available for you



Meet this Magcobar Man, a ship captain . . . he's a key man in your drilling mud supply line

The basic ingredients for drilling muds come from all over the world. With drilling muds and chemicals playing a bigger role in today's deep, higher pressure drilling, it is vitally important that the oil industry know exactly where its supply will come from in the years ahead.

The future supply of high quality drilling muds depends on production capacity and raw material reserves, particularly barite deposits. Magcobar is the world's largest producer of barite, and has the world's largest reserves of this important drilling mud additive.

In addition to mines in Magnet Cove, Arkansas; Potosi, Missouri; Greybull, Wyoming; Zavalla, Texas; Battle Mountain, Nevada and Hinson, Florida; Magcobar also has mines in Greece, Nova Scotia and Mexico. To develop and maintain these mines and plants, Magcobar has reinvested a far greater share of its earnings annually on exploration and plant construction than any other mud company.

This world-wide program assures you of an adequate supply of the highest quality materials from Magcobar today . . . and in the future!

Magcobar
Complete
DRILLING MUD SERVICE

MAGNET COVE BARIUM CORPORATION

Houston, Texas

DOMINION BRIDGE

at Canadian Petrofina

Illustrated are two of many large pressure vessels fabricated by Dominion Bridge and now in service at Canadian Petrofina Limited—Canada's newest refinery.

Platework and structural steel by Dominion Bridge have been supplied to numerous Canadian refineries from coast to coast.

Send for copy of booklet "Platework for Every Industry" Publication No. PNN-100

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They Say—

History Repeats in Utah

Dear Sir:

I was particularly interested in your article, "New Strike Accents the Enormity of Utah's Oil Reserves" *(The Oil and Gas Journal, December 10, page 183)*. Of course, we all appreciate the oil shale reserves and the gilsonite, but I feel as you do that there is a vast quantity of oil tied up in the Green River Beds, Wasatch, and Mesaverde. It is going to be in stratigraphic traps.

It takes considerable prospecting, but the oil is there. I feel particularly fortunate to be sitting on the Havenstrite Ute Trail unit which now has a gas well on it and a good oil well, and I think there will be other places that will be as favorable.

I quite agree with you and I have contended for a long time that there are going to be numerous strat traps in the basin. It is a question of history repeating itself.

Dorsey Hager
Consulting geologist
Salt Lake City.

Europe's Pipeline Possibilities

Dear Sir:

I have finished reading the article, titled "Big-Inch Lines Through Turkey Studied," printed in No. 83, Vol. 54, of The Oil and Gas Journal, and find it to be quite interesting.

B. E. HULL

In the absence of engineering studies, I feel confident that there is enough demand for crude oil to supply Scandinavian and United Kingdom refineries to offer most attractive possibilities for a jointly owned big-inch crude-oil pipeline originating in the vicinity of Marseilles. Moreover, I am confident that present and future demand for petroleum products in the region lying between Marseilles and Wilhelmshaven is now sufficiently large to make a jointly owned big-inch products pipeline a very attractive project, regardless of whether local refiners may build shorter lines to supply their own needs.

The trend is for product-consuming regions to build local refineries, so ultimately, absolutely no products will move through Gibraltar. Meanwhile, I believe a big-inch products line, lo-

When you develop a new product, do you invite A NEW FIRE HAZARD?

Ingenious formulations that create new sales may, at the same time, lead to unexpected fire hazards ...especially if flammable liquids are part of the picture. Don't be ambushed by these "surprise" risks. Ask National Foam for recommendations on proper fire protection!

NATIONAL FOAM System, Inc.
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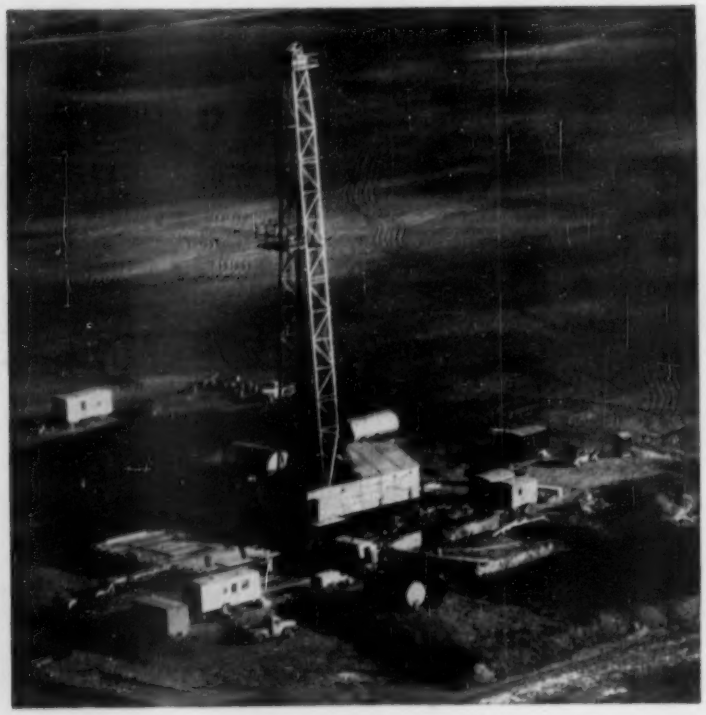
The only company exclusively engaged in the design, development and manufacture of foam fire protection equipment and chemicals.

Shadows spell wealth on Canadian prairies



Over vast plains where evening shadows once silhouetted ancient trails worn by the buffalo herds, the tracks of bulldozers tell the story of thousands of oil and natural gas properties that are bringing wealth from Canada to the world.

This evolution is no new story to The Canadian Bank of Commerce. For generations, we have maintained offices throughout that region, and now have more than 150 branches in the oil field areas. Our complete Petroleum and Natural Gas Department, at Calgary, is helping oil executives in every branch of the industry to get the facts on Canadian oil fast, accurately and up-to-date.

For further information, write to our Business Development Division, Head Office, Toronto 1, Canada—or direct to our Petroleum and Natural Gas Department, 309-8th Avenue West, Calgary, Alberta.

(We do not advise on the merits of specific oil securities)

THE CANADIAN BANK OF COMMERCE

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cated approximately parallel to the crude-oil system, but with intermediate branches, could generate enough business to make it a profitable project. Surely consideration will be given to providing two or more terminals for the crude-oil line, even to the extension of it to refinery regions in Belgium and in Holland, and across some narrow stretch of the English Channel to refineries in the United Kingdom.

The routing of new systems through Turkey to a proposed new Mediterranean terminal at Iskenderun, Turkey, seems to have no merit now other than a possible improvement in future political complications. The proposed route would have to cross ranges of the formidable Taurus Mountains, or traverse them throughout all of Asiatic Turkey. Surely the I.P.C. will rehabilitate its pump stations in Syria . . ."

Burt E. Hull
Retired president
Trans-Arabian Pipe Line Co.
Dallas.

Drilling in the Early Oil Fields

Dear Sir:

After reading the specifications of some of the late rotary drilling outfits, what a far cry it seems from the rotaries with which great fields such as Sour Lake, Humble, and Caddo were brought into production.

On one of the early wells at Caddo our drill pipe was a string of 6¼-in., 28-lb. casing with long collars. The fishtail bits were dressed by the driller with a large ball pein hammer. There was but one pulley in the crown block, additional lines being secured by tying a double block just under the water-table.

Mud was obtained from a pond alongside the derrick, where a couple of farm boys were kept stirring it up. We had chain tongs as backup tongs but casing tongs had not yet appeared and each thribble was set up or broken out by the use of a piece of soft rope and a 12-ft. casing pole.

As the well reached the top of the producing sand, the square drill stem would begin bobbing. If any bob was somewhat greater than common, every member of the drilling crew was poised to run and had picked out a clear path away from the well.

Actually, most of the wells drilled themselves in because the driller would come out of the hole when he thought the gas pressure was too severe. A number of the wells got away, but it is a mystery to me yet that we were not all killed. Nevertheless, wells were brought in that flowed in excess of 25,000 bbl. a day and gas wells that made more than 100 million cubic feet.

No attempt was made to shut a well

in until it had flowed off its first head. Any derrick that was not black was either a drilling well or a dry hole. At about the time I mention, the first copies of The Oil and Gas Journal appeared on the Jack Robbins Cigar Stand in the old Phoenix Hotel at Shreveport.

W. C. Lehman
Olympia, Wash.

Emergency Oil Movements

"The movement of the oil (to Europe) is a bigger problem than availability of the oil itself. This involves not only transportation from producing fields in the U.S. to deep water, but also ocean transportation from the U.S. to points abroad. Tankers are the crux of the latter job.

"It should now be possible, through the work of the Middle East Emergency Committee, to use available tankers in the most efficient manner as, for example, by avoiding cross-hauls—that is, duplication of tanker voyages—and allocating ships to the most effective runs. Our affiliates are making every effort to have cargoes promptly ready at seaports when tankers arrive, and the ships are losing no time in taking on loads.

"Estimates are that the oil industry may be able to provide from the Western Hemisphere enough oil so that, when added to what can be moved from the Middle East, up to 80 per cent of Western Europe's normal needs will be covered as long as the present situation continues."

M. J. Rathbone, president, Standard Oil Co. (N.J.), in a speech before the Tulsa Chamber of Commerce.

CALENDAR OF EVENTS

JANUARY

9-11 American Association of Oilwell Drilling Contractors, conference for drilling executives, University of Houston, Houston.

14-16 Pipe Line Contractors Association, ninth annual convention, Boca Raton Hotel and Club, Boca Raton, Fla.

14-18 Society of Automotive Engineers, annual meeting, Sheraton-Cadillac and Statler hotels, Detroit.

17-18 Engineers Joint Council, Statler Hotel, New York.

21-25 American Institute of Electrical Engineers, 1957 winter general meeting, Hotel Statler, New York City.

23-24 Northwest Petroleum Association, Nicollet Hotel, Minneapolis.

25-26 American Association of Petroleum Landmen, directors meeting, Hilton Hotel, San Antonio, Tex.

31-Feb. 1 Annual instrument short course of Southern California Meter Association, Los Angeles Harbor Junior College, Wilmington, Calif.

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Emergency
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Emergency
Shutdown
Repairs get top priority in the Glitsch plant. You can always count on Glitsch to get you back on stream as quickly as possible.
The basic design of Glitsch "Truss-Type"® tower internals affords unusual protection against wreckage caused by explosions and serious bumps. Because of this, we are usually able to effect from 90 to 95 per cent recovery of Glitsch internals returned to us for repair. And after we expedite an emergency order through our plant we send back a complete set of installation drawings; too, if the services of our experienced field personnel can be used to assist your boilermakers in the initial hours of the installation, he is no farther away than your telephone. Because of Glitsch service like this, operators do not have to carry a large stock of fabricated parts for quick replacement.
Call Glitsch in on scheduled turnarounds, too. Regardless of the process, your project will be expertly fabricated according to all requirements, at competitive prices, and with a quality of workmanship that is unexcelled.
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2
GREAT NAMES ARE JOINED!
SEE PAGES
266, 267

FEBRUARY

7-8 Western Petroleum Refiners Association, Gulf Coast regional technical-industrial relations meeting, Lamar Hotel, Houston.

8-9 American Society for Testing Materials, Symposium on composition of petroleum, Jung Hotel, New Orleans.

13-15 National Association of Corrosion Engineers, Tulsa section, eighth annual short course for pipeliners, Hotel Mayo, Tulsa.

15-16 National Society of Professional Engineers, spring meeting, Hotel Francis Marion, Charleston, S. C.

22 Natural Gasoline Association of America, Permian basin regional meeting, Scharbauer Hotel, Midland, Tex.

23-25 Instrumentation for the Process Industries, sponsored by Texas A. & M. College, chemical engineering department, College Station, Tex.

24-28 American Institute of Mining, Metallurgical and Petroleum Engineers, annual meeting, Hotels Roosevelt and Jung, New Orleans.

25-27 American Association of Petroleum Geologists, Rocky Mountain section, Rainbow Randevu, Salt Lake City.

27-28 Gas Conditioning Institute, sponsored by the University of Kansas extension, Southwest Kansas Center, Randall's, Liberal, Kans.

MARCH

3-6 American Institute of Chemical Engineers, regional meeting, the Greenbrier, White Sulphur Springs, W. Va.

6-8 American Petroleum Institute, Southwestern district production division meeting, Statler-Hilton Hotel, Dallas.

8 Ohio Oil and Gas Association, winter meeting, Deshler-Hilton Hotel, Columbus, Ohio.

11-15 American Institute of Chemical Engineers, regional meeting, Philadelphia.

11-15 National Association of Corrosion Engineers, Kiel Auditorium, St. Louis.

12-13 Subsurface Geology Symposium, fifth annual conference, sponsored by the University of Oklahoma, Norman, Okla.

13-15 Society of Exploration Geophysicists, tenth annual mid-western meeting, Hotel Texas, Fort Worth.

20-22 American Petroleum Institute, southern district production division meeting, Washington-Youree and Captain Shreve Hotels, Shreveport, La.

25-27 Western Petroleum Refiners Association, annual meeting, Hilton Plaza Hotel, San Antonio, Tex.

27-29 American Power Conference, Sherman Hotel, Chicago.

APRIL

1-4 American Association of Petroleum Geologists, national convention, Kiel Auditorium, St. Louis.

2-4 Corrosion Control, fourth annual conference, sponsored by National Association of Corrosion Engineers and the University of Oklahoma College of Engineering, University of Oklahoma, Norman, Okla.

7-10 Petroleum Equipment Suppliers Association, annual convention, Palm Springs, Calif.

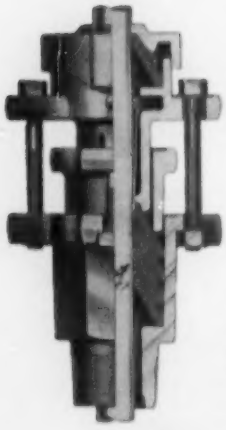
7-12 American Chemical Society, national meeting, Miami, Fla.

8-10 American Society of Mechanical Engineers, spring meeting, Dinkler-Tutwiler Hotel, Birmingham, Ala.

9-11 American Welding Society, fifth annual welding show, Convention Hall, Philadelphia.

10-12 American Petroleum Institute, Mid-Continent district production division meeting, Mayo Hotel, Tulsa.

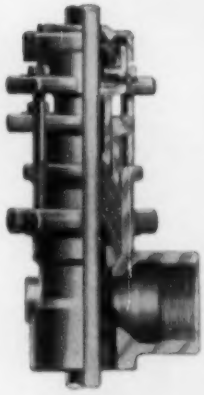
ONE OF THESE
Hercules Stuffing Boxes
CAN END YOUR PUMPING WORRIES*



"REGULAR TYPE" DUPLEX POLISHED ROD STUFFING BOX

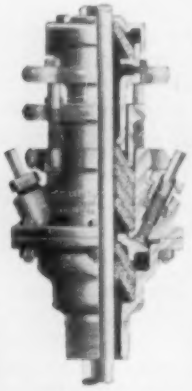
The old reliable, tried and proved on thousands of wells from coast to coast and in foreign fields.

HERCULES OIL RESERVOIR UPPER GLAND



"TEE BASE TYPE" DUPLEX POLISHED ROD STUFFING BOX

A combination Stuffing Box and Pumping Tee. Makes a short connection. Bolt lugs are placed low to eliminate fouling of elevator links. No bell nipple needed as top of body will support elevator. Full opening — unnecessary to remove body when pulling or running rods.



"TYPE DP" DUPLEX POLISHED ROD STUFFING BOX

A Double Packed Stuffing Box for use on high pressure wells and those that flow intermittently. Especially desirable for wells located near buildings, fire hazards of growing crops. Two compression bolts, in bottom sections, are tightened on Cone Rings to pack-off while replacing packing in upper section.

All HERCULES Stuffing Boxes are made of high grade malleable iron which prevents shattering if rods drop. They are tested to 3,000 pounds psi pressure and all use the famous HERCULES Split Cone Packing Rings.

* All HERCULES Stuffing Boxes may be equipped with Oil Reservoir Upper Glands on "problem" wells which pump-off and burn the packing. The polished rod moves through the oil in the reservoir which lubricates and cools it.

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Export Representative: Oil Field Equipment Co., Inc., 30 Church Street, New York 7, N. Y.

11-13 American Institute of Mining, Metallurgical, and Petroleum Engineers, Pacific Northwest Regional Conference, Portland, Ore.

16-18 Petroleum Industry Electrical Association, annual meeting, Shamrock Hotel, Houston.

16-18 Petroleum Electric Suppliers Association, Shamrock Hotel, Houston.

16-18 Southwestern Gas Measurement Short Course, University of Oklahoma, Norman, Okla.

16-18 National Petroleum Association, fifty-fourth semiannual meeting, Cleveland.

24-26 National Gasoline Association of America, thirty-sixth annual convention, Rice Hotel, Houston.

24-26 American Petroleum Institute, Rocky Mountain district production division meeting, Gladstone, Townsend, and Henning Hotels, Casper, Wyo.

25-27 American Association of Petroleum Landmen, third annual convention, Hilton Hotel, San Antonio, Tex.

28-30 Independent Petroleum Association of America, midyear meeting, Buena Vista Hotel, Biloxi, Miss.

29-30 Automatic Control in the Petroleum and Chemical Industries, conference sponsored by the University of Oklahoma, extension study center, University of Oklahoma, Norman, Okla

29-May 1 Southern Gas Association, annual convention, New Orleans.

MAY

6-8 American Petroleum Institute, annual pipeline conference, Cleveland Hotel, Cleveland.

6-8 American Geophysical Union, thirty-eighth annual meeting, National Academy of Sciences, Washington, D. C.

7 American Gas Association, committee on underground storage, operating section, Mark Hopkins Hotel, San Francisco.

8-10 American Gas Association, Pacific Coast Gas Association, gas supply, transmission, and storage conference, Mark Hopkins Hotel, San Francisco.

12-15 Liquefied Petroleum Gas Association, annual meeting, Conrad Hilton Hotel, Chicago.

13-15 Industrial Waste Conference, sponsored by Purdue University, Purdue Memorial Union Building, Lafayette, Ind.

13-16 American Petroleum Institute, division of refining, midyear meeting, Sheraton Hotel, Philadelphia.

14-16 Industrial Nuclear Technology Conference, sponsored by Armour Research Foundation of Illinois Institute of Technology and Nucleonics Magazine, Museum of Science and Industry, Chicago.

19-22 Texas Independent Producers and Royalty Owners Association, Galvez and Buccaneer Hotel, Galveston, Tex.

20-22 American Gas Association, chemical, engineering, and manufactured gas production conference, Balmoral Hotel, Bal Harbour, Fla.

20-23 American Society of Mechanical Engineers, twenty-ninth annual conference and exhibit of the oil and gas power division, Kentucky Hotel, Louisville, Ky.

21-23 Pennsylvania Gas Association, annual meeting, Pocono Manor Inn, Pocono Manor, Pa.

22-24 American Petroleum Institute, division of production, Eastern district meeting, William Penn Hotel, Pittsburgh.

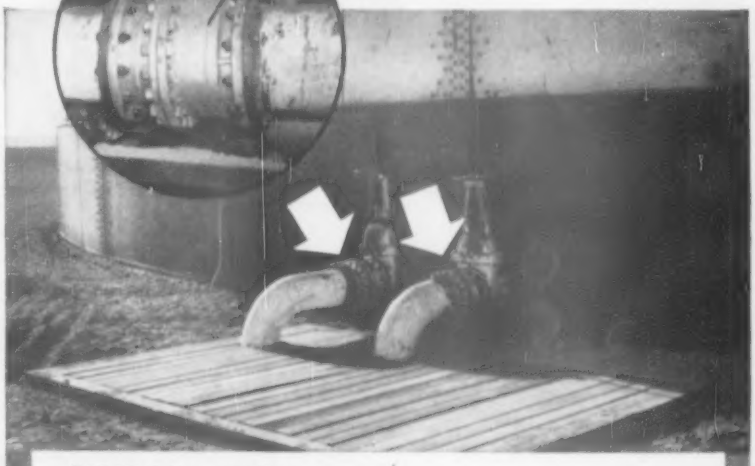
23-24 Kentucky Oil and Gas Association, annual membership meeting, Hotel Phoenix, Lexington, Ky.

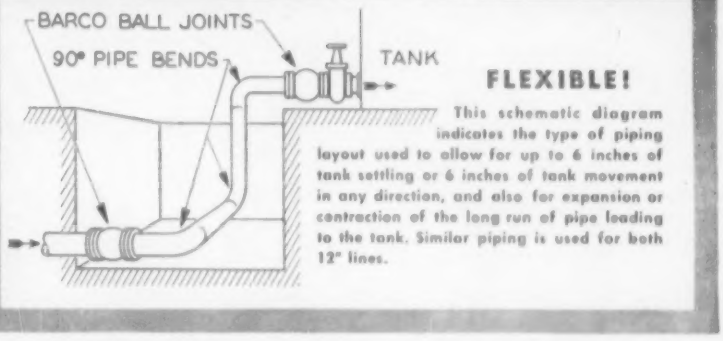
NEW

12" BARCO

Flexible Ball Joints

(also new 8" and 10" sizes)





FLEXIBLE!

This schematic diagram indicates the type of piping layout used to allow for up to 6 inches of tank settling or 6 inches of tank movement in any direction, and also for expansion or contraction of the long run of pipe leading to the tank. Similar piping is used for both 12" lines.

Built to Handle Big Tank Jobs!

One of the first places where twelve of Barco's new large size Flexible Ball Joints have been put to use is on three 170,000 bbl. West Coast tanks which receive crude from a new 12,000 ft. long 24" off-shore pipeline. As shown in the above photograph, each tank is connected by two 12" lines—each fitted with two 12" Barco Ball Joints. The joints provide the following advantages:

1. **Allow for tank settling or tilting. Also pipe expansion.**
2. **Isolate tanks against earthquake shock; also pump shock.**
3. **Maximum protection against Fire Hazards.**

For detailed information about new 8", 10" and 12" Barco Ball Joints, see our nearest representative or WRITE FOR NEW CATALOG 215B. Joints available in Bar-Ductile metal or steel; flanged or welding ends. 15° angular flex.

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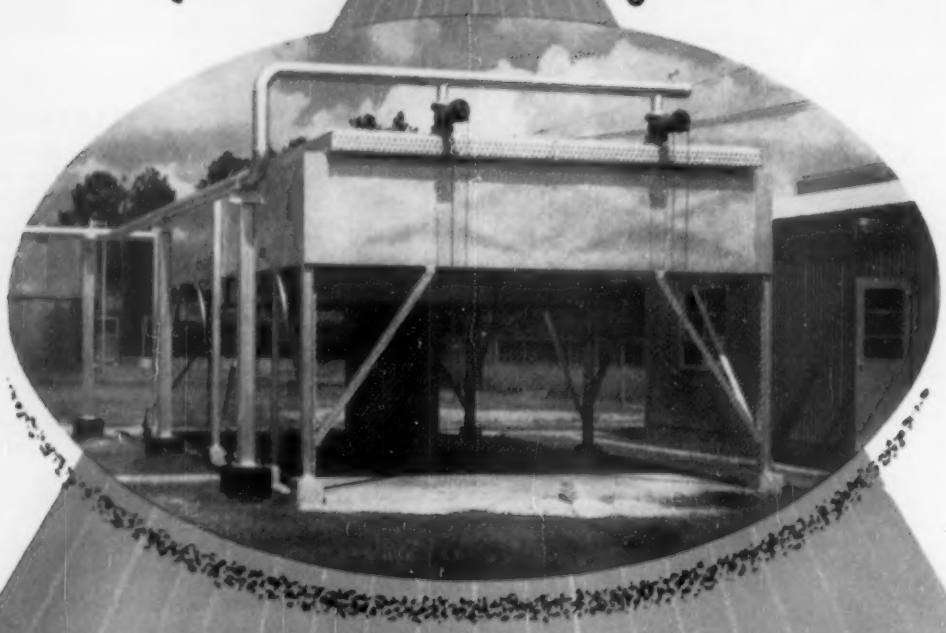

From the leading manufacturer of air cooled heat exchangers comes the most advanced designing and highest quality equipment on the market today.

Smithco's extensive background plus their unequalled engineering and manufacturing ability, establish them as leaders in air cooling.

For air cooled heat exchangers of unequalled performance always look to Smithco.

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the OIL AND GAS JOURNAL

TULSA, OKLAHOMA

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JOURNALLY SPEAKING . . .

Cultural Notes

TO be a social success these days you have to discuss the Middle East situation intelligently. And since you're an oil man, naturally everybody expects you to know all about it.

That's why you should brush up on the maps and data in this annual international issue. But, unfortunately, to be a drawing-room lion you need to know even more things than are in this fact-packed issue.

For instance, there's a lot of talk about the Gaza Strip, which the Israeli army captured from Egypt and appears intent on keeping. Did you know that this was the birthplace of the gauze strip, used in every hospital in the world? Generations ago the inhabitants of Gaza were famous for a loosely woven cotton cloth, and the name (with slightly corrupted spelling) has stuck.

Now isn't that useful information? You can throw it out casually in the middle of a discussion of the Middle East crisis and make yourself a reputation as a man of broad culture and erudition. With conversation thus brought to a complete stop, you can add that muslin similarly originated in Mosul, now the center of Iraq's oil fields. If your listeners are still with you, remark that of course everybody knows that damask dinner napkins first came from Damascus, capital of Syria, the country that's blocking repair of the I.P.C. pipelines.

Oil men ought to be informed on things like this. It shows that they're not crass materialists but have an interest in culture and human affairs. The Middle East has had troubles and crises before this; and every place mentioned in current news dispatches gives a clever conversationalist a chance to display his knowledge. But in case you don't have time to brush up on the Old Testament, archeology, ancient history, and the Arabian Nights, we'll attempt to supplement your oil information with a few cultural footnotes.

Our chief source of these pearls of wisdom is another big yellow book, also famous for maps and facts—our esteemed contemporary, the National Geographic Magazine. From it we learned, for example, that this same Gaza was the place where blind Samson pulled down the pillars of the temple. (Draw your own analogy with what's happening there now.)

Kirkuk is the origin point of the now-idle pipelines to the Mediterranean. But its connections with the oil industry go back further than that. A natural-gas seep there has been identified as the biblical "fiery furnace" of Shadrack, Meshack, and Abednego. Also at Kirkuk was unearthed the first known map, a clay tablet made in 2500 B.C. Where would the oil industry be without maps?

The other end of the I.P.C. pipeline is Baniyas, which was a seaside resort in the days of the Roman Empire and which gets its name from an old Latin word for bathing. That makes it a comparatively modern town.

On the other hand, Tapline unloads its Arabian crude at Sidon, the port from which the ancient Phoenicians dominated the commerce of the Mediterranean and even traded with what is now England. In biblical times the twin ports of Tyre and Sidon were considered wicked cities. We trust that visiting oil men and tanker crews haven't worsened Sidon's reputation.

There's talk of a new pipeline from the Persian Gulf swinging north to the Turkish port of Iskenderun, also called Alexandretta. That was where Alexander the Great defeated Darius the Persian in 333 B.C.

Another pipeline is proposed through Israel, starting at the head of the Gulf of Aqaba, the home port of King Solomon's navy. Part of this line would follow an old Roman road which in turn was laid over what was known as the King's Highway in Moses' time.

That big new gusher that has been running wild in Iran is near Qum, which was the home of Darius the Persian. But long before that, in 1700 B.C., Qum was the birthplace of the famous Code of Hammurabi, the world's first body of written laws.

Basrah, an important oil town in Iraq, was the port of Sinbad the Sailor. It could also be called the birthplace of printing, because in 4000 B.C. its rulers used carved stone cylinders to impress seals on clay tablets.

These are just samples of how you can tie oil news in with general knowledge. But if it's only oil data you want, you'll find plenty of it starting with page 105.

—Henry D. Ralph.

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Why conservation is a mockery in Oklahoma

IN this issue the Journal begins a series of articles on oil conservation, production practices, and regulatory methods in Oklahoma.

The articles are the result of a protracted investigation by Journal staff reporters. What they found is not pleasant. It reveals a distressing deterioration of conservation principles in the state that once was called the cradle of conservation.

The findings substantiate and detail the charge, made twice during the past two years on the Journal's editorial page, that conservation is a mockery in Oklahoma.

OUR PURPOSE in this is purely to promote conservation. For 25 years the Journal has espoused conservation. We believe that conservation of our irreplaceable oil and gas resources through wise and fair state regulation is a public duty in the national interest and also is the foundation for a healthy and long-lived petroleum industry.

This study was urged on the Journal by a number of substantial independent producers and medium-sized operators in the state. Like most enlightened independents, they believe in conservation. They want conditions under which their heirs and successors can be in the oil business in Oklahoma for a long time to come.

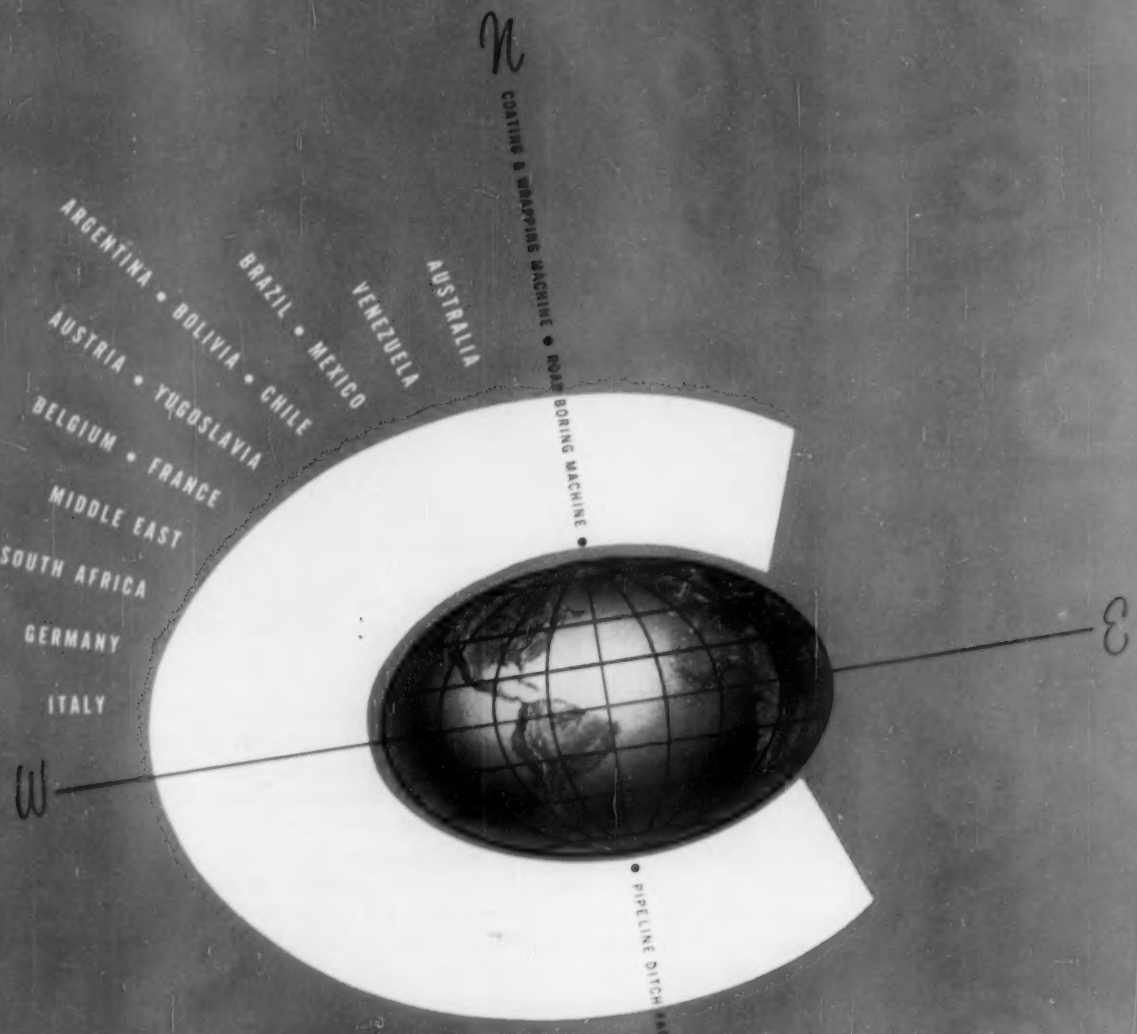
The Journal is not taking sides in the running argument between majors and independents over the level and division of market demand for Oklahoma crude. We believe true conservation is not an issue between majors and independents, but can be achieved with fairness to both.

Nor are we attempting to meddle in state politics. We are not after anybody's job, not putting the finger on any individual or group. Oklahoma's trouble is political—but in the broad sense of that term. State officials, large and small operators, and the citizenry at large are all to blame for the lackadaisical and indifferent attitude toward conservation. Over a long period of years things have drifted from bad to worse.

WE HOPE in these articles to be constructive, to do a service to the industry. We hate to see conservation fail in any state. We fear that the bad example set by Oklahoma may injure the cause everywhere.

By calling attention to the wasteful production practices, dissipation of reservoir energy, flouting of correlative rights, inequitable application of rules and regulations, and general disregard of the law, which are all too common in Oklahoma, we hope to rouse the industry into action.

We hope that Oklahoma producers will take steps to correct the situation. And we also hope that other states will be vigilant to avoid drifting into the same condition.



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Current and significant in . . .

The Industry This Week

Drilling

• **New champion submersible drilling barge** is being built at Mobile for offshore work in the gulf. It features the twin, side-by-side hulls of a catamaran. P. 90.

New depreciation yardstick for rotary drilling rigs has been devised by Internal Revenue Service. It's on an operating-day basis. P. 97.

California wildcatters are coming up nearly empty handed this year. They have found 29 new oil pools around known producing structures. But of the six rank wildcat discoveries, none was a commercial producer. P. 98.

Industry

• **Conservation in Oklahoma** may be breaking down. It's operating strictly on the honor system, oil men say, with the result that the conscientious company is being penalized. P. 86.

Steel got a twin jolt last week. ODM ruled out allocations to help tanker builders get steel and turned down new tax write-offs for steel-plant expansions. P. 92.

Pipelining

• **El Paso Natural's $84.6 million** expansion project has been approved by the FPC with this warning: Firm up gas supply before submitting any new projects. P. 97.

Extra capacity of 25,000 bbl. daily of crude will be available after January 1 in the Rancho Pipe Line from West Texas to the gulf because of a new booster station. P. 97.

Emergency pipeline paralleling Suez Canal and capable of carrying 500,000 bbl. of oil daily is proposed by A. S. Onassis, rich Greek shipping magnate. He is reported negotiating now with Egypt. P. 103.

Threat to private microwave systems worth $30 to $40 million is seen in FCC proposal to turn them over to common carriers. P. 102.

Battle to serve Carolina tidewater region with natural gas has been won by Transcontinental Gas and two utilities it serves. P. 99.

Production

• **Texas annual production** is setting an all-time record despite fewer producing days. Output in 1956 is expected to exceed billion barrels. P. 93.

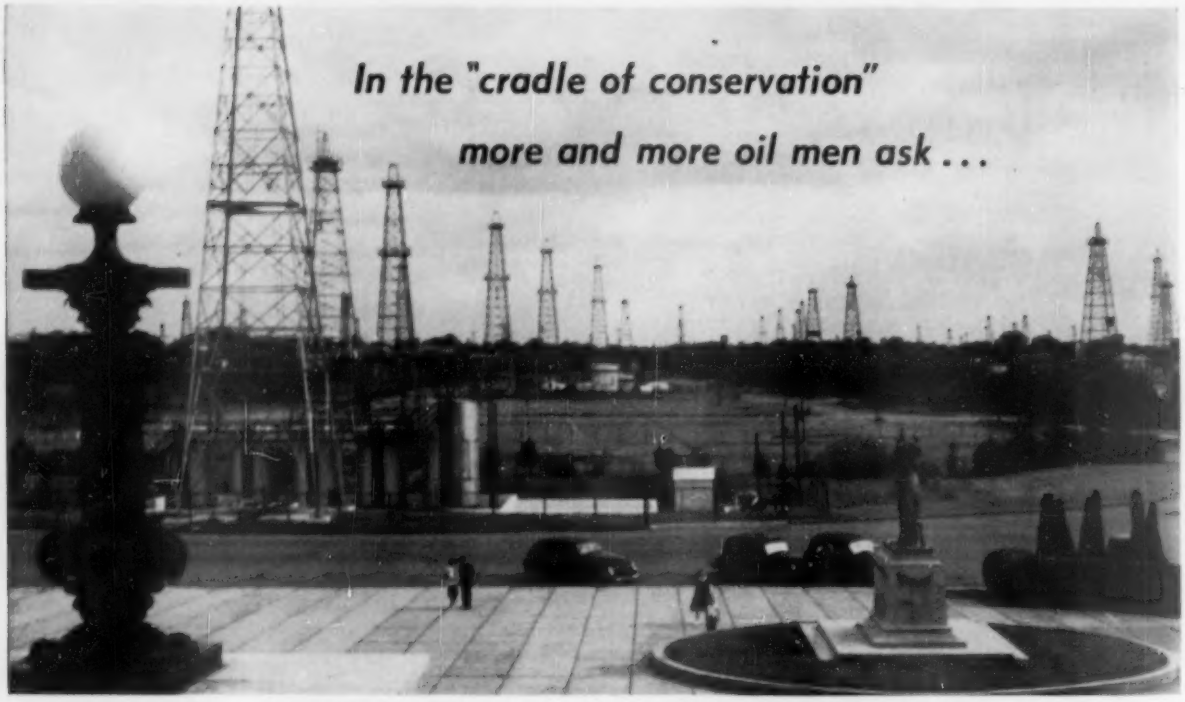
Production of 1,800 to 2,500 bbl. daily is being claimed for latest French discovery in Sahara Desert region of Algeria. P. 104.

Refining

• **World's largest refining center** soon will be the Philadelphia area along Delaware River Valley. It already is world's biggest importer of crude. This will be enhanced by a deep-water terminal in Delaware Bay linked to the refineries by a 500,000-bbl. daily pipeline. P. 96.

Push-button refinery will be a step closer when Esso installs a computer-logger as part of a new fluid catalytic cracking unit at its Cuban refinery. P. 94.

L.P.G. suppliers could stand plenty of cold weather. Their stocks at first of December were up 59.3 per cent from last year. November sales were 47.2 per cent off. P. 100.



Oklahoma City field as seen from the south portico of the state capitol.

Is Oklahoma Wasting Its Oil Resources?

- Conservation is put strictly on the honor system in Oklahoma. Operators claim this has one upsetting result: It's the conscientious company that's penalized.

- Exploration is being discouraged, they say, and the future is too uncertain. Here's a Journal staff report on what's going on and why . . . the first of a series.

CONSERVATION may be coming apart at the seams in Oklahoma.

Oil producers, both large and small, declare that:

. . . **Waste of oil and gas** is occurring because modern methods of production and regulation are not being used.

. . . **Development of new oil** and gas reserves to maintain the state's rank in the petroleum industry is not being encouraged.

. . . **Gross inequities** in treatment given individual producers and individual pools are cropping up.

. . . **General deterioration** in applying both the letter and spirit of conservation laws is resulting in sloppy administration by enforcement officials and disregard for the law by producers in general.

. . . **Substantial investments** are going to other states where conservation is applied with a view to the future.

These general observations were gleaned in a canvass of the industry by staff writers of The Oil and Gas Journal. The survey also turned up scores of complaints, criticisms, and specific instances of improper practices.

Do-it-yourself . . . The only conservation being achieved in Oklahoma is done by the operators themselves and not the Corporation Commission.

That's the way one operator sums up the situation in this state. And instances related by many other operators indicate that this estimate may not be far wrong.

Conservation in Oklahoma is run on the honor system. The commission does not attempt to police the industry closely to secure strict enforcement of all conservation regulations. Its policy is to rely on the good faith of the operators. There is evidence that this trust has been abused.

As one producer expressed it:

"The commission assumes that everybody is going to comply with the regulations and file truthful reports. So it does very little checking of field practices. It figures that if anything is going wrong, somebody will complain.

"You and I know that things just don't work that way. As in any in-industry, a certain percentage of oil men are not above winking at the rules. And when lack of enforcement lets some people get away with shortcuts, pretty soon competitors do the same. Eventually hardly anybody is complying with all the rules, and conservation suffers."

Shamefacedly, several operators admitted that they are guilty of infractions. It's not that they don't believe in conservation, but that they can't keep their field men from doing what offset producers are doing.

"Go out into the oil patch if you want to see what's happening to conservation," advised one. "Policies laid down by the companies' home offices don't mean a thing.

"My company's policy is to comply

with all conservation rules strictly, but I know darned good and well that a lot of our farm bosses and field men are violating the regulations every day. Why? Simply because they see producers all around them doing the same thing.

"Field men don't like paper work and they're under pressure to produce as much as possible and keep expenses down. So they cut corners because they know the commission won't crack down."

General letdown . . . Companies operating in several states say there is a big contrast in the prevailing attitude toward conservation in Oklahoma and other southwestern states.

"The whole industry has drifted into bad habits in this state," said one. "The commission doesn't enforce its regulations well enough, and the operators aren't sufficiently concerned to see that good conservation practices are followed. We're all at fault."

Another one puts it bluntly:

"The commission left the conservation job to the industry, and the industry left the job, period."

The production superintendent of one major company, recently transferred to Oklahoma from Texas, said he was "flabbergasted" at some of the things he found going on here and which he considered unsound and injurious to conservation. He asked his field men if these were legal, and was told:

"Well, they may not be exactly legal, but the commission condones them and everybody else does them."

Others are frank to admit that their own operating methods are looser in Oklahoma than in neighboring states. They attribute it to a general letdown in conservation on the part of both the commission and the industry.

"It's common practice to do things here that we wouldn't think of doing in states with strict enforcement," a number of producers admitted.

How come? . . . How did Oklahoma, sometimes called the "mother of conservation," get into its present situation?

There seems to be no one single reason. The Journal's interviews turned up a number of explanations:

. . . The Corporation Commission itself, having many other duties, has not paid enough attention to conservation matters and to the functioning of its conservation division.

. . . Enforcement policy is based largely on complaints from the industry rather than compliance actions brought by the commission's field staff. If no operator complains, it is assumed that conservation is working adequately.

. . . Engineering data on modern production practices and reservoir control are not given as much weight as in other states.

. . . Avoiding controversy, compromising disputes, and pleasing the greatest number of people seems to take precedence over scientific application of conservation.

. . . Proration and problems of dividing the market among pools have diverted attention from the more basic matters of long-range conservation.

. . . Unallocated areas have become exempt not only from proration but also from conservation requirements and even from ordinary good operating practices.

. . . Routine reports of operators are not always filed promptly and properly and are not properly processed and examined by the commission, with the result that Oklahoma does not have the statistical basis for conservation control that exists in other states.

What's happening

The Journal survey turned up many instances of sloppy field practices.

Everybody isn't guilty of these things, by any means. But the operators who are guilty have an economic advantage over those who want to play by the rules.

Here are some of the things that good operators say are not only possible but are actually being done in this state:

. . . Drilling wells without filing an intent or without making a completion or plugging report.

. . . Off-pattern spacing without commission approval.

. . . Surface casing inadequate or omitted, with damage to fresh-water sources.

. . . Plugging improperly done, endangering fresh-water supplies and hampering subsequent water flooding.

. . . Dual completions and commingling of oil from two zones, with potential damage to producing reservoirs.

. . . Overproduction of individual wells, resulting in reduction of ultimate recovery and injury to adjoining lease owners.

. . . Rigged tests for initial production, potentials, salt-water production, and gas-oil ratios to show what the operator wants.

. . . Gas conservation going by default through improper flaring, gas-oil ratios, gas-well spacing, unratable take, and proration of gas-cap fields.

Most of these poor practices take place in the unallocated areas. There, by common consent, normal conservation practices can be ignored with impunity if the operators choose, because exemption from per-well allowables has become exemption from compliance with other rules.

But many operators say that the same indifference to production methods that will save oil and gas is spreading to a considerable extent into the allocated pools.

1. Drilling

"There are hundreds of wells in this state that the commission has no record of whatever," asserted one operator. "Some of them are abandoned but many of them are producing."

This was verified by others, one of whom said: "It's possible to drill wells in unallocated areas, put them on production, and sell oil to a pipeline without the commission ever knowing anything about it. It's been done."

Oklahoma does not require advance permission to drill, but the operator is supposed to file notice of intent before starting. Many operators, it is said, don't get around to filing the notice until after the well is completed—or they may forget about it entirely.

When drilling is through, the operator should file either a completion report or a plugging report. But, in unallocated areas, compliance is up to the operator. If he gets a producer he is automatically entitled to an allowable, and he can assign it to himself without bothering with paperwork.

"You can follow the trail of certain operators across the state," one man declared. "You can see that it's their custom to drill without filing intent, case and complete improperly, plug and abandon in unsafe ways, and put wells on production without reporting."

The case of casing . . . "Here's an example of what goes on," explained another.

"We're supposed to set surface casing down to a certain depth to protect fresh-water supplies. But some one-gallus cable-tool drillers don't set any casing at all. They just use an oil drum with the bottom cut out to keep the topsoil from being kicked into the well. If the well is dry they fill the hole with fence posts and junk, shovel a little dirt on top, and move on leaving absolutely no record.

"But when some farmer's water well goes salty, of course he blames a big oil company operating in the vicinity."

Another operator's criticism goes to the regulations themselves. They don't require cementing of surface casing when a well is plugged.

"If the casing is left in and the well properly plugged with mud, it may protect fresh-water sands adequately," he explained. "But when steel is scarce and expensive a second-hand pipe dealer can come along and pull the casing

MAN ON THE SPOT in Oklahoma's troubled conservation picture is Massena Murray, conservation director for the Oklahoma Corporation Commission. Most oil men feel Murray is trying to restore the principles of conservation in the state but is hampered by politics and a struggle between opposing forces within the oil industry. His father, former Gov. William H. (Alfalfa Bill) Murray, was instrumental in birth of conservation in Oklahoma.

out of abandoned wells if it is not cemented in.

"This leaves the fresh-water sands unprotected, and salt water can come up and pollute them. I have heard of more than one case where this has happened."

Shifting locations . . . It's legal to shift a well location and drill off the spacing pattern in an unallocated area or with a wildcat.

The rules permit this to be done without a hearing if consent of the adjoining lease operator is obtained. But one operator explained:

"Very often we own the adjoining lease, too, so we give ourselves permission to drill where we please. In some cases we probably should have a reduced allowable for drilling off spacing, but we have never been penalized. That's not good practice. The rule is too lax."

But here's a worse example—though it may be an isolated case:

"A Texas operator moved up here and staked a well right on the line of our producing lease," one company man asserted.

"We notified this operator that he was violating the law and also filed a protest with the commission. Nothing happened. He went ahead and drilled and brought in a producer.

"We finally forced the commission to hold a hearing, and the guy's only defense was that he was new in the state and didn't know the rules.

"The commission never did anything, and today that well is offsetting us right against the lease line. He would never have got away with that in Texas, and he would know better than even try."

2. Plugging

A good many operators are critical of plugging practices in Oklahoma. Some say the regulations need to be tightened up and modernized to bring them into line with latest practices.

In deep wells, they say, obsolete practices may cause blowouts, endangering life and property as well as damaging fresh-water sources.

All operators interviewed insisted that they always plug abandoned wells in accordance with the best approved methods. For this reason, they say, it is quite proper for the state inspectors to permit them to "plug by telephone." They notify of intention to plug, proceed to do so in the proper manner, and then file the required report.

But, some say, this offers a loophole to the kind of operator who hates to add an expensive plugging bill to the cost of a dry hole. If he knows that no inspector will check up on him, there's a big temptation to skimp on a few sacks of cement or a few hours' rig time.

Many instances were cited where this has happened. Poor plugging doesn't show up until much later—usually by salt getting into nearby water wells.

Water trouble . . . Not long ago one big independent company at its own expense provided a new water supply for a small town in western Oklahoma. The town's wells began producing salt water, and this company, as the nearest operator, was blamed.

"On the basis of careful engineering data," the head of this company said, "I'm sure our oil operations were not the cause. The salt water came from abandoned holes on adjoining leases that were drilled by another operator who plugged them improperly and then moved on.

"But to avoid a lawsuit, and because we want to be good citizens and keep the town in drinking water, we drilled new water wells in a different location and hooked them up to the town's system.

"That never would have happened if the commission had enforced good plugging methods."

Like a sieve . . . Poor plugging not only endangers water conservation, but oil conservation too.

This happens when an attempt is made to water flood an old field where wells were improperly cased and badly plugged. When incomplete records were filed the flood operator has no knowledge that such wells exist.

"When the flood hits these old wells, the water spouts out of the field like a sieve," one man explained. "Salt water moves up into fresh-water strata and ruins water wells for miles around.

"There have been cases where a flood project had to be abandoned because it would be too expensive to locate all those old wells and replug them properly. As a result much oil is left unrecovered forever."

3. Production

Oklahoma statutes—like those of most oil states—place limits on the rate at which an oil or gas well can produce.

One purpose of this may be proration—to keep the state's total output in line with market demand and to allocate a fair share to each well.

But apart from proration, there are basic conservation principles behind restrictions on producing rates. These are to protect reservoir energy, prevent bypassing oil in the ground, get maximum ultimate recovery, and protect correlative rights and prevent unfair drainage of adjoining leases.

Operators interviewed by the Journal say that many of these basic conservation principles are being lost sight of in Oklahoma. Again their criticism is directed primarily at the unallocated areas—but not entirely. They cited instances where failure to crack down on an occasional flagrant violator has led to widespread disregard of approved production practices.

Two pays . . . Dual completions and commingling of oil and gas from two zones without knowledge of the commission is a device which quite a few operators mentioned.

The reason the commission ought to approve such commingling is that in many cases one or the other reservoir may be damaged, and its ultimate yield reduced, if pressures are equalized or fluids permitted to migrate between zones.

But it's a lot cheaper and less trouble to produce two or more zones together.

One operator explained:

"Commingling of production from two or more reservoirs in dually completed wells is not generally prohibited in the unallocated areas. This is bad practice, except in thin sands where the pressure is about gone anyway.

"In some pools the operators voluntarily keep production separate in the well bore as a matter of good practice. But it's up to them. In unallocated areas the operators are free to make their own rules."

But here's a story about an allocated areas—Velma field, where the commission authorized dual completions but prohibited commingling. An independent producer told it:

"I was on our lease one day and saw the bottom half of a two-stage pump lying on the ground beside a producing well. Our pumper explained that all the operators had so much trouble with sanding that they all took out the dual pumps and produced both zones together.

"Sure enough, all over the field the wells were being produced that way. I suppose on the day when the commission's inspector is due to come around, all the dual pumps will be put back into use, but only as long as the inspector is there to check up."

The dual-completion gimmick works in reverse, too.

"I know for a fact," one man related, "that a certain operator filed for and received two allowables for one well—one from each producing zone. But he actually had only one producing zone, and the well was not even set up for a dual producer. Nothing ever was done about it."

Big Pond case . . . Here's one instance of a slight move toward tightening up. Big Pond pool, in Creek County (an unallocated pool) has wells dually completed in the Prue and Skinner sands. These dual completions were made without notice to the Corporation Commission.

Last September the commission's conservation director wrote the operators in Big Pond, suggesting that perhaps there was commingling of oil from the two reservoirs within the well bores and excessive flaring of gas—both violations of conservation regulations. He suggested that the operators draft a plan to correct these conditions and apply to the commission for a hearing.

"This is progress," said one of the operators concerned. "At least it shows that the commission is becoming aware of some of the things that are going on.

"But in any other state the operators wouldn't dare to try such a thing. And if they did, the commission would learn about it pronto and shut them down. And why should the operators be asked to submit a plan? The commission ought to clamp down, write a field rule for Big Pond, and then set a hearing at which the operators could protest if they desire."

4. Testing

The do-it-yourself conservation program in Oklahoma applies particularly to the various sorts of routine and periodic well tests, such as initial production tests, potential tests, gas-oil ratio tests, and salt-water tests.

For the most part these tests are not required in unallocated areas nor in certain allocated pools exempted from test requirements. And where the tests are made, in most cases they apparently are not witnessed by commission agents. With many types of tests it is permissible for the operator to make the test himself and have his report signed by an offset operator.

"That's a perfect setup for people who don't mind fudging a little bit," in the words of one operator.

"It's a case of 'you scratch my back and I'll scratch yours.' If all the operators in a field make a practice of winking at each other's violations they can make the tests improperly—or make none at all—and get away with it."

In the Seminole area there is a field producing from two zones, with separate allowables and separate gas-oil ratios for each zone.

"On the lease adjoining ours," one operator related, "there is a battery of six tanks in a row, all hooked up together. There's a separator at each end, one for the production from each zone. In making a gas-oil ratio test, the farm boss can open a valve between tanks and mix oil from the two zones to show whatever gas-oil ratio he wants.

"I don't say that this producer is rigging his tests, but there are other tank batteries in the field hooked up the same way and it would be easy enough to get away with some juggling.

"About a year ago a conservative department inspector told me he was going to report this to the commission, but nothing ever happened."

Salt water . . . The best kind of well to have in Oklahoma is one that produces some salt water, one man said. This is an exaggeration, but the rules on salt-water exemption seem very lax.

Any well that produces 75 per cent water is exempted from allowables restrictions. Operators interviewed by the Journal showed a difference of opinion as to how closely commission agents check the tests on which producers get exemptions. But one man said:

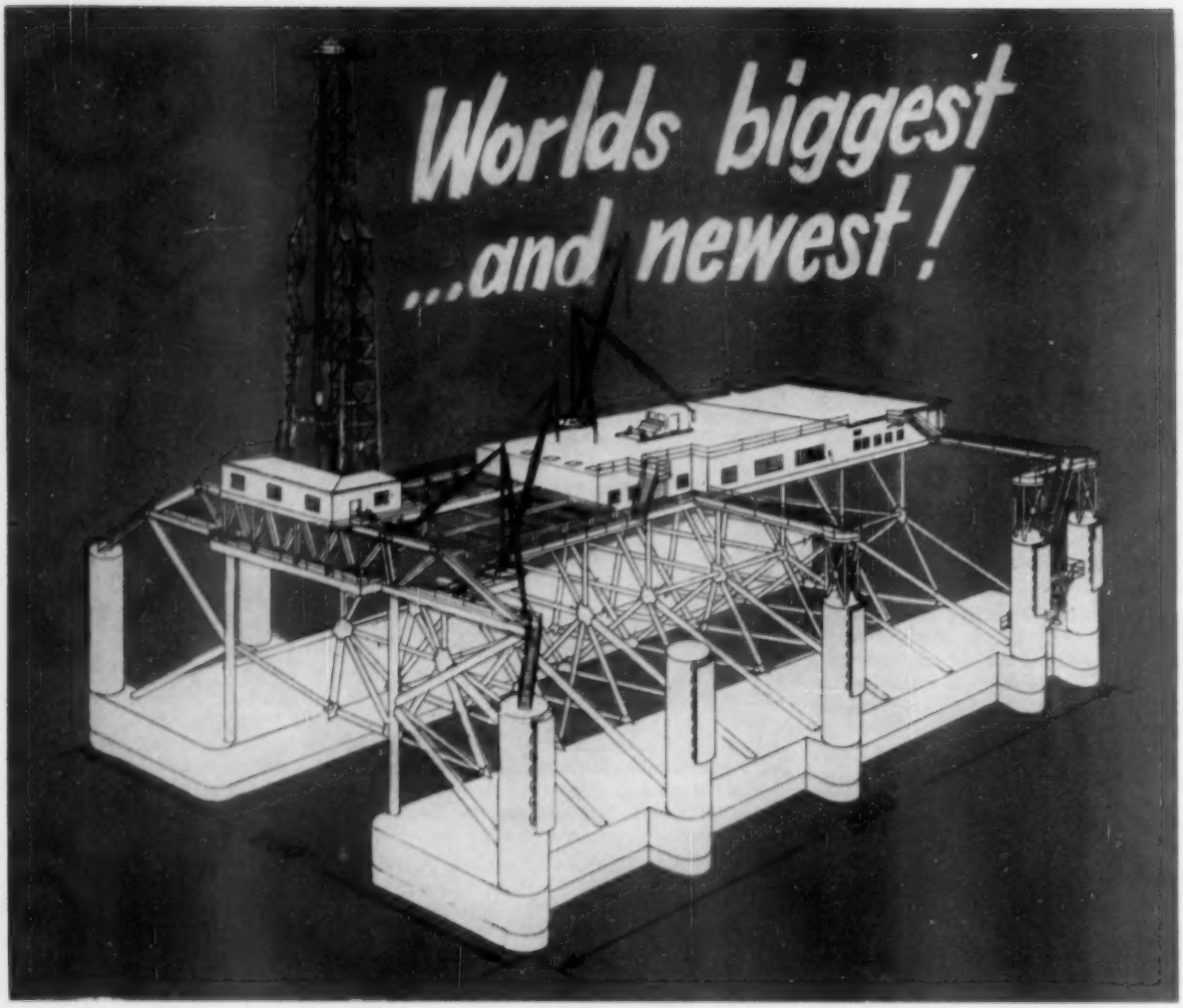
"I can take any well producing some water and handle it in such a way that it will produce 75 per cent water during the test. Unless the state inspector watches the well for some time both before and after the test, I can rig it to get a salt-water exemption."—**END.**

Next Week: Proration

Many Oklahoma oil operators blame conservation troubles outlined on these pages on the state's system of prorating production among various wells and various fields.

Next week's special article will deal with proration in Oklahoma. It involves a system of allocated and unallocated fields and per-well and lease-basis allowables. Its workings affect every phase of the industry in Oklahoma.

The third article in the series will discuss administrative procedures of the Oklahoma Corporation Commission and will outline what oil men think should be done to shore up the shaky conservation structure in the state.



Submersible Barge Sports Split Hull

NEW ORLEANS.—Ocean Drilling & Equipment Co. has taken the wraps off its new submersible drilling barge, "Margaret," the newest giant of the offshore drilling fleet. The vessel is being built at the Mobile yards of Alabama Dry Dock & Shipping Co.

Design of the barge is unusual in offshore structures. It features the twin, side-by-side hulls of a catamaran. The catamaran long has been synonymous with nautical stability.

Dimensions have been pushed to over-all length of 300 ft. and width of 200 ft. This should make the structure completely stable while floating, under tow, or while raising or lowering. The dimensions also make "Margaret" the biggest offshore structure of any type built to date. Only approach to her size is Rig 46 recently launched by Kerr-McGee Oil Industries, Inc. Rig 46 is 200 ft. by 242 ft.

Its advantages . . . Creators of "Margaret" claim she has three basic advantages:

. . . Stability. Because of its great size, the structure should be next to impossible to overturn in waters no deeper than its 65-ft. operating depth.

. . . Simple mechanisms. There are no complicated jacks or pontoons to assist in raising or lowering the barge. Such equipment, while necessary to many designs for that depth water, is subject to failure and expensive to maintain.

. . . Reasonable cost. In spite of great amount of steel in "Margaret," her cost of $3 million compares favorably with other smaller designs. The owners figure maintenance expense will be nominal.

How idea born . . . Actually ODECO didn't start out with the idea of a split-hull catamaran when it began designing "Margaret."

The object was to design a vessel with a base large enough to make the unit completely stable at all times. When a conventional one-piece hull was laid out, this large engineering study showed the center section wasn't really needed. So, ODECO simply left out the center of the hull so that the structure became two hulls. And, in this way, the characteristic catamaran shape crept in.

Each hull, or pontoon, is 40 ft. wide and 300 ft. long. The space between them is 90 ft. On the outside of each pontoon are five stabilizing columns 14-ft. in diameter and rising 72 ft. above the bottom of the pontoons. It is these vertical columns which give stability during raising and lowering.

ODECO first used large, cylindrical columns such as these on its barge

"Mr. Charlie," which has been operating in the gulf nearly 3 years. The columns were so successful in raising and lowering the barge that the design has been expanded for the greater depth of "Margaret." Also, the vertical columns serve well as boat bumpers while the unit is drilling.

The working deck, 70 ft. wide and 300 ft. long, is supported by trusses which rest on the two base pontoons. Vertical distance from bottom of the pontoons to the working-deck level is 93 ft. There's no connection between the stabilizing columns and the working deck.

Quick mover . . . In offshore drilling, there are many operating factors calling for a simple, stable design. But, ODECO considers one of the most important of these is safety of the men and structure in case of a blowout or well fire.

By making it virtually impossible to turn "Margaret" over, ODECO hopes that the drilling crew itself could safely float the vessel and pull it off location quickly in such an emergency. Normal time to pump out a full ballast load is 3 hours. And "Margaret" will float with a lot of ballast still in the hull. Since there are no pilings to jack free nor any extra pontoons to float, it should be possible to get the unit away from a blowing well in less than 3 hours.

The amount of equipment around the wellhead is kept to the minimum to reduce damage to the structure itself in case of blowout. And the rig will drill from the extreme end of the deck. All other equipment, including controls for raising and lowering, engines, pumps, and crew quarters, is as far as possible from actual drilling operations.

The equipment . . . Since it is difficult to spot a submersible barge exactly on a well location, the rotary table and crown block on "Margaret" are adjustable in a 2-ft. radius.

Thus, the barge can be spotted as nearly on location as is possible. Then, the rotary and crown block can be moved to make wellhead location exact. The adjustable mast, made by Emsco Manufacturing Co., is a 142-ft. double-bulge special type rated at 1,125,000-lb. nominal capacity.

Rig drive is electric with power generated by two Fairbanks-Morse 1,600-hp. opposed-piston diesels. Each of these engines drives in line two 1,200-kw. d.c. generators and one 400-kw. d.c. generator. Under normal conditions, only one engine and one set of generators will work at a time.

The Emsco EDES draw works is driven by two 800-hp. compound-wound d.c. motors. Rotary is powered by a separate 600-hp. compound d.c. motor. Each of the pumps—two 850-hp. Gardner-Denver GXR's—are powered by a single 1,000-hp. motor which is direct connected to the pump drive shaft.

For auxiliary and barge-equipment power, there are three diesel-engine-driven a.c. generators.

Little water to haul . . . "Margaret" will have 3,500 bbl. of fuel aboard—some 3,000 bbl. of it stored in the hull and the remaining 500 bbl. in tanks built into the deck.

The 3,500 bbl. of drilling water will be stored in similar fashion. The 1,000 bbl. of potable water will all be stored in tanks built into the deck.

So that "Margaret" and her rig will be free of water-hauling cost, ODECO has installed waste-heat evaporators aboard that are rated for 1,000 gal. per hour of fresh water output. This quantity should be enough to supply all potable and drilling-water requirements.

Work available . . . The "Margaret's" first location is scheduled to be for Shell Oil Co.

Location of the first well has not been announced yet, but "Margaret" is capable of working in the worst bottom-soil conditions the Gulf of Mexico has to offer. Soil-bearing loads will be low enough that the barge can operate at the mouth of the Mississippi River where soil conditions are the worst anywhere on the coast.

October Imports Set Record

TOTAL imports of crude and products set a new all-time record in October, but neither crude nor products exceeded group records.

The average was 1,608,100 bbl. daily, topping the previous record of 1,578,300 bbl. daily set in December 1955.

Crude imports averaged 1,061,200 bbl. daily or 10,600 bbl. daily under the record set last July.

Product imports amounted to 546,900 bbl. daily, well under the 653,200 bbl. daily reported for February 1955.

A combination of the highest product month with the top crude month would give a total of 1,725,000 bbl. daily.

Other comparisons of important movements:

. . . Canada set a record for exports of crude oil to the United States, with an average of 144,500 bbl. daily. The previous record was established last March with 128,600 bbl. daily.

. . . Crude from Venezuela averaged 476,800 bbl. daily compared with the July record of 526,100 bbl. daily. July was the only month with a record above half-a-million barrels daily.

. . . Iraq oil came into the U. S. at the rate of 43,100 bbl. daily during October—the second highest month for imports from that country. Record month was last June with 45,800 bbl. daily.

. . . Imports from Iran reached the highest level since the return to operations in that country under the international oil consortium. The average was 31,900 bbl. daily, slightly above the 30,000 bbl. daily reported for last June.

Residual imports averaged 469,800 bbl. daily, probably a record for October but well under the winter peak of 587,700 bbl. daily reported for January 1956.

Exports . . . Total exports rose to 335,100 bbl. daily, the highest level since August 1955. Crude exports increased 19,800 bbl. daily over September to account for the major portion of the gains.

IMPORTS INTO CONTINENTAL U. S.
(Thousands of barrels)

	Oct. 1956	Sept. 1956	Oct. 1955
Crude—			
Mexico	880	310	244
Colombia	875	886	746
Venezuela	14,781		12,885
Ecuador			72
Peru		245	
Trinidad	233	111	
Kuwait	4,682	4,366	4,605
Saudi Arabia	2,493	1,801	2,264
Neutral Zone	493		165
Iraq	1,335	860	821
Iran	988	657	402
Qatar	158	524	175
Canada	4,479	3,567	1,744
Far East	1,501	1,195	996
Total crude	32,898	28,629	25,119
Daily average	1,061	954	810
Products—			
Residual fuel	14,564	9,864	9,687
Other products	2,391	2,460	1,405
Total products	16,955	12,324	11,092
Daily average	547	411	358
Total all oils	49,853	40,953	36,211
Daily average	1,608	1,365	1,168

EXPORTS*

Crude	1,444	805	871
Gasoline	2,214	2,514	2,663
Kerosine	330	58	93
Distillate	2,596	2,170	2,279
Residual	1,298	1,522	1,913
Lube oils	1,070	1,041	1,071
Other products	1,435	1,176	1,263
Total all oils	10,387	9,286	10,153
Daily average	335	310	328

*Excludes shipments to territories.

Steel Handed Twin Jolt

● Flemming rules out priorities for tanker plate, turns down quick tax write-offs for expansions in steel plants

WASHINGTON.—The Government pulled the plug on a mad scramble for steel plate for tankers last week.

Mobilization Director Arthur S. Flemming in related decisions:

. . . **Ruled out allocations** to help tanker builders get steel.

. . . **Turned down tax-inspired** expansion program for the steel industry.

The result: Tankers now building and planned will go ahead only as and when shipyards get the plate.

Flemming's decisions in both matters were unanimously approved by the Defense Mobilization Board, composed of top officials from a number of government departments.

What's involved . . . The ruling on tankers took into account two factors:

. . . **A National Petroleum Council** report on the number of oil carriers being planned through 1961.

. . . **President Eisenhower's request** for a report from Flemming on what the Government should do to insure an "adequate" tanker fleet.

Refusal to promote further expansion of the steel industry will toss out the window some 80 applications representing $2.3 billion in new plate, structural, tubular goods, and related production plants.

Any expansion, in the near future at least, will have to come voluntarily from the steel industry without the advantage of accelerated tax amortization.

Who gets help . . . The proposal to provide more plate for tankers called for their designation as direct defense rather than defense-supporting facilities.

But any such change would result merely in relieving shipyards at the expense of production of other items, many also defense-supporting, Flemming said. It would, for instance, deprive makers of oil-production equipment of steel which they too need.

The reclassification of tankers was seen by Flemming as leading to a series of undesirable steps:

. . . **Lack of steel** would force producers of oil equipment machine tools, freight cars, etc., to ask also to be included in the defense-material system.

. . . **Distorted supply situation** would result for all nonrated consumers of basic materials and could lead to drop in industrial production and employment.

. . . **Inequitable treatment** charges would result and put the Government in the position of having to put into effect an over-all controlled-materials plan.

Flemming described reasons for the decision as:

"It is believed that any advantages that might be gained by providing for materials allocations for anything other than direct military and atomic energy items would be more than outweighed by the adverse effect that such action would have on the soundness of the economy as a whole. A controlled economy would not provide a solid foundation for the current defense mobilization program."

Only basic needs . . . The decision on steel expansion was based on the argument that the Government should not lend itself to supporting an expanding civilian economy to meet current requirements in excess of basic wartime needs.

The principle followed by the Government in the past and to be followed in the future, Flemming said, is to act only to fill a gap between present production and the military needs, war-supporting needs and the needs of a rock-bottom civilian economy in a time of full mobilization.

There is no such gap in the case of steel, Flemming found. There may be a need for further expansion next fall, however, it was disclosed.

The Defense Department has prepared estimates of requirements for raw materials. These, however, became obsolete even as they were finished as a result of recent military reorganizations. New estimates will have to be drawn up, but probably will not be completed before next fall, according to Deputy Secretary Reuben B. Robertson, Jr.

Present thinking in the Defense Department is that the new requirements will be lower for most materials than they have been in the past, Robertson disclosed.

Builders of new tankers will continue to be eligible for quick tax write-offs, ODM officials said. The present program calls for a goal of 100 vessels. It is about two-thirds filled, leaving room for 30 or more ships. But the goal could be increased if the situation warranted it, they suggested.

A.P.I. report shows in 1956 . . .

. . . Industry Records Shattered

NEW YORK.—The U. S. oil and gas industry broke nearly every record again this year.

For the first time in history, total supply and demand exceeded 9,000,000 bbl. daily, according to the American Petroleum Institute's year-end report.

Total supply averaged 9,376,000 bbl. per day, up 596,000,000 bbl. over 1955. Demand averaged 9,270,000 bbl. daily, up 490,000 bbl. over last year.

Domestic production of crude oil and natural gasoline rose to 7,956,000 bbl. daily, as compared with 7,532,000 in 1955. Domestic demand averaged 8,879,000 bbl. per day, in comparison with 8,415,000 in 1955.

This included an estimated 1,420,000 bbl. daily of imports of foreign oil, an increase of 172,000 bbl. daily over the 1955 average. U. S. exports increased 25,000 bbl. daily to 391,000.

The A.P.I. figures show natural-gas production for 1956 at an all-time high of 12.7 trillion cubic feet, representing an increase of 840 billion cubic feet over 1955.

Refined stocks up . . . Stocks of crude oil and products at the end of the year were estimated at a record 753,000,000 bbl. Most of the 1956 increase is represented by natural and refined products rather than crude oil.

Refining capacity increased by more than 300,000 bbl. daily in 1956, for a total of 8,948,800, the A.P.I. reported.

Total well completions may show a slight decrease for the first time in the last half-dozen years. Estimate for 1956 is 58,850, representing an increase of 2,184 wells over 1955; however, three-fourths of the latter figure were either service wells or dry holes.

U. S. SUPPLY AND DEMAND FOR PETROLEUM PRODUCTS
(Thousands of barrels daily)

	1956	1955	Inc.
Supply			
Crude production	7,158	6,807	351
Natural gasoline	798	725	73
Total imports	1,420	1,248	172
Total supply	9,376	8,780	596
Domestic Demand			
Gasoline	3,781	3,621	160
Kerosine	337	320	17
Distillate	1,738	1,593	145
Residual	1,556	1,527	29
Other	1,467	1,354	113
Total domestic	8,879	8,415	464
Total exports	391	366	25
Total demand	9,270	8,781	489
Stock change	106	—1	107

Texas Plays It Big

● Records set for crude, gas, refinery runs—and a bigger demand is ahead

AUSTIN.—Despite an all-time low total of producing days, Texas will wind up 1956 having produced more oil than in any year in its history.

Production is expected to reach 1,075,829,000 bbl.—about 54,000,000 bbl. or 5.3 per cent higher than in 1955.

The state's oilers produced this much in 190 days in 1956, or 51.9 per cent of the time. In 1955, Texas wells produced 194 days or 53.2 per cent of the time.

The hike in production is due to a big increase in the number of producing wells. The Texas Railroad Commission in its annual year-end report said the number of net oil wells carried on its schedules went up 8,092 during the year to 171,468, a 4.95 per cent gain.

Operators completed 568 wildcat oilers and 135 wildcat gassers during the year as compared with 415 and 89, respectively, in 1955.

Gas up, too . . . Texas gas wells produced 4.217 trillion cubic feet this year, or about 156 billion cubic feet more than in 1955.

Casinghead also went up, with a 1956 total of 1.78 trillion cubic feet. This volume was about 104.9 billion cubic feet higher than last year. From this gas, operators extracted almost 190 million barrels of liquid hydrocarbons —up 12.6 million barrels.

Runs increase . . . Texas refiners, the commission said, charged 922,590,153 bbl. to stills during the year, up roughly 70,000,000 bbl. from 1955.

Refinery production increased from about 820,000,000 bbl. in 1955 to almost 880,000,000 bbl. in 1956. The bulk of the increase was in gasoline, where output went up from about 372,000,000 bbl. last year to about 406,000,000 bbl. this year.

New high in early 1957 . . . The commission predicted that demand for Texas crude during the first quarter of 1957 would hit an all-time peak.

Stocks of crude and all major products except gasoline will fall to desired levels or below, it said.

As to gasoline stocks, the commission was less optimistic. These, it said, "are quite excessive, and there seems little likelihood that any improvement in their positions can be expected in the near future."

watching WASHINGTON

. . . with Bertram F. Linz

Missing link . . .

STEPS may be taken within a few months to bridge a serious gap in the nation's pipeline network, from the Ohio area to the East Coast.

Mobilization planning has long been stymied by the lack of an alternate means of supplying the New Jersey area with oil from the Gulf Coast in the event of wartime interruption of tanker service.

The Government has had two proposals for a products line from Texas eastward, but both stopped at the Ohio River. They left it up to the Government to build the East Coast link.

There is no argument about the security need for this link. But there has been no economic need for it in the oil industry. One of the proposals is for conversion of Texas Eastern Transmission Corp.'s Little Inch line from gas to products. The other is for a products line by American Pipe Line Corp. Both have been dormant for some months.

The Middle East crisis has revived interest in the line. The Office of Defense Mobilization has been asked by the FPC for its views on the defense aspects of Little Inch conversion. Director Flemming is expected to give strong support to Texas Eastern's plan.

Meanwhile, two plans to build the East Coast leg from Ohio have been received by the ODM. American Pipe Line would tie the leg onto its proposed line from the gulf if given government aid. But another group, Underground Storage & Explorations, Inc., of upper Darby, Pa., is willing to build it without a government loan if given quick tax write-off. The latter proposal hinges on FPC approval of the Little Inch conversion, since the two lines would be tied in.

Waterways still grow . . .

WELL over 140,000,000 tons of crude oil and refined products were moved over the inland waterways this year.

The importance of the 29,000 miles of rivers and canals which make up the inland waterway system is realized by few. It is particularly important to the oil and chemical industries, which account for more than a third of the total tonnage.

The little tug that pulled a barge up the Mississippi River years ago has given way to a powerhouse that can haul 35,000 tons of crude in one tow. Few tankers now on the seas carry larger loads.

Improved channels and modern equipment are attracting business to the waterways. It is estimated the oil movement this year was 17 per cent above 1955—an increase of more than 20,000,000 tons.

Industrial plants are being built in increasing numbers along the waterways to take advantage of low-cost transportation. The chemical industry, much of it based on oil or gas, has put $1.5 billion into such plants in the past 12 months.

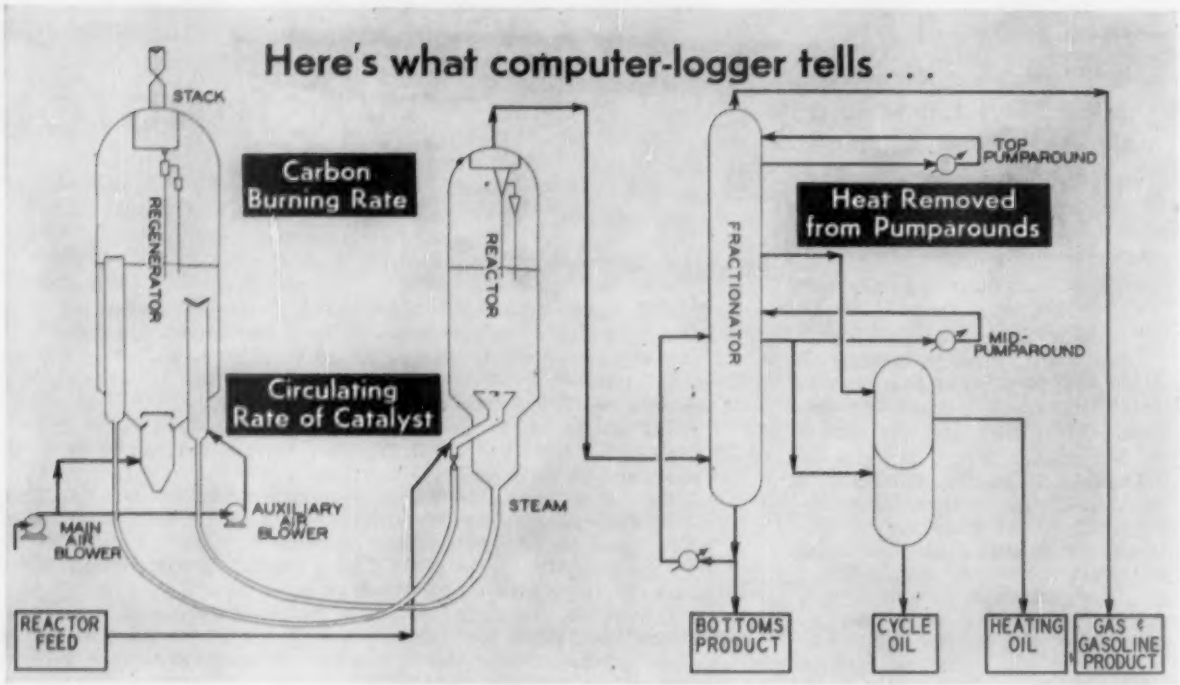
To talk or not to talk . . .

CONGRESS has frequently criticized government agencies for their tendency to withhold information from the public on the ground that secrecy is necessary for security reasons.

But the Interstate Commerce Commission, without congressional prodding, is working to make more information on oil pipelines available.

The law permits the ICC to withhold information for defense reasons. But commission officials believe some of its data on pipelines and facilities could be released without endangering our security.

The ICC is asking pipeline carriers under its jurisdiction and other interested parties how far they think it should go in lifting the veil.



Automatic system supplying process data brings nearer the . . .

Push-Button Refinery

● In addition to providing 11 operating guides, Esso's setup eliminates manual collection of figures. This gives it a big time-saving advantage

ELECTRONIC computers are bringing the goal of an automatic refinery nearer reality. For the first time a computer is being integrated directly into a new fluid catalytic cracking unit.

The step is being taken by Esso Standard Oil, S.A., at its Belot refinery near Havana, Cuba. The computer system is being designed by Fischer & Porter Co. of Hatboro, Pa.

The device is a general purpose analog computer coordinated with a log-sheet printer. It will be tied in directly with a new 24,000-bbl. Model IV unit.

Use of computers in refinery operations is not new. But previously they have been located in a central computing center where they analyze data from a variety of sources.

Quick answers . . . The Esso computer will be a push-button operation.

It will process scores of pressure, temperature, flow rate, and other readings. These variables together with numerous constant factors will be automatically fed into a program of predetermined equations. The instrument derives almost instantaneous solutions and prints 11 key sets of data known as operating guides. The logger also tapes 101 process variables.

These operating guides will be available to operators hourly or more frequently if desired. This direct tie-in holds an obvious advantage over other computer systems. It eliminates the time lag attending manual collection and feed-in of data. The improvement over manual calculations is even greater.

The Esso system warns operators of any deviation from normal operating conditions as they occur. This improves operators' ability to spot potential upsets and correct them before they occur.

What it does . . . Esso did not reveal all of the 11 operating guides which the computer-logger will provide.

But four of them are: Carbon burning rate in the regenerator, catalyst circulation rate, and heat removal from each of two pumparound circuits on the tower.

THIS COMPUTER system will be built into a fluid cat cracker at Esso's Cuban refinery.

The two heat-removal guides involve fairly straightforward multiplication of several factors provided by the unit's instruments. They measure amount of heat removed from a bypass stream withdrawn from the primary tower, passed through heat exchangers and then returned to the tower.

For those interested the equation for this process is:

Heat removal = liquid flow rate of the bypassed stream × specific heat of the stream (a constant) × the difference in temperature of the stream leaving and reentering the tower × a constant K. The logged solution is expressed in millions of B.t.u.'s per hour.

Catalyst flow rate involves a more complex calculation. The equation automatically fed to the computer follows this form:

K_1 × flow rate of CO_2 leaving the regenerator + K_2 × flow rate of CO leaving the regenerator + K_3 × flow rate of air entering regenerator + K_4 × total flue-gas flow rate × (per cent CO_2 + per cent O_2 + ½ per cent CO) − K_5 × flow rate of air to the regenerator × the difference in the regenerator temperature and the temperature of incoming air at the blower outlet point.

This total factor is divided by the specific heat of the catalyst × the difference in catalyst temperature leaving and entering the regenerator. The split-second solution by this heat-balance method will give operators a reading on fluid-catalyst circulation rate never before available with such promptness or frequency.

Pointing ahead . . . The Fischer & Porter system represents the latest step in automatic data handling. It points toward complete closed-loop process control.

The 11 typed operating guides expressed in digital form require no further calculation or correlation by operators or engineers. In addition, the system provides 101 process variables including both pneumatic and electrical inputs. These may be logged at any time by pushing a button. Further, major process quantities derived from these variables are automatically totaled and recorded every 24 hours.

The two electric logging typewriters are equipped to punch all quantities on paper tape. This tape, properly identified and keyed, provides data storage and is used for accounting analysis on business machines.

Designers claim the Belot logger-computer has three advantages when used as a general-purpose analog device with automatically programed solution of process data. It cuts the cost of the system, reduces maintenance, and requires a smaller space.

Processing briefs

The expansion goal for alkylate production facilities has been reached and the tax-amortization incentive for new plants will be dropped this week.

Mobilization Director Arthur S. Flemming said alkylate is one of six items for which adequate production has been built and programs are to be closed.

The closing of the alkylate program, however, does not mean that new expansions will not be given government support if it is found in the future that they are required. But it is the policy of ODM to close programs as the government-set goals are reached.

Universal Oil Products Co. has formed a market research and economics department to aid client companies in solving problems in plant expansion and modernization. M. D. Gilchrist, vice president, will have over-all responsibility for the new department. Samuel W. Curry has been appointed department head.

Petrochemicals will be manufactured for the first time by Ashland Oil & Refining Co. The Ashland, Ky., firm has announced that proposed cash expenditures for capital improvements during the 1957 fiscal year will exceed $20,000,000. Half of this will be used for additional improvements to refineries and for the beginning of a program for the manufacture of petrochemicals.

A new acrylate ester plant will be built in Pampa, Tex., by Celanese Corp. of America. With a capacity of 15,000,000 lb. of acrylic acid esters per year, the plant is expected to begin production the last quarter of 1957. The Pampa plant is the latest step in Celanese's chemical expansion program.

Celanese recently completed a new plasticizer and functional fluid plant in Point Pleasant, W. Va., and is constructing a new polyol production unit in Bishop, Tex.

A 2,000,000-volt Van de Graaff particle accelerator will aid radiation studies of California Research Corp., a Standard Oil Co. of California subsidiary. The firm has installed the unit at its Richmond laboratories for use in programs dealing with effects of radiation on petroleum products and on acceleration of reactions leading to useful byproducts. The machine was purchased from High Voltage Corp., Cambridge, Mass.

Shell Oil Co. will add a second U.O.P. Platforming unit at its 79,000-bbl. Wilmington-Dominguez refinery in California. The multimillion-dollar project includes a 16,000-bbl. Platformer and a catalytic hydrodesulfurizing unit which will treat feed stock. Construction contract has been let to Kaiser Engineers Division of Henry J. Kaiser Co., Oakland, Calif. Building will start early next year.

Shell Oil Co. has awarded contract to Kaiser Engineers Division of Henry J. Kaiser Co. for the construction of a new Platformer at its Los Angeles refinery. Included in the project will be a Unifiner for desulfurizing gasoline stocks. Work will begin in early 1957.

Also for Refiners . . .

U. S. refiners were getting more crude in October than at any other time. Product imports also set a record that month (P. 91) . . . Refiners may feel the pinch of an ODM ruling that no tax write-offs will be granted expansions in the steel industry (P. 92) . . . Esso Standard is taking another step nearer the automatic refinery. A computer that will give 11 operating guides and cut the time in computing data will be built into a Model IV fluid cat cracker going up at Esso's Belot refinery near Havana, Cuba (P. 94) . . . The Delaware River Valley area will become the world's largest refining center once Tidewater completes its 130,000-bbl. refinery at Delaware City. The Tidewater plant will boost capacity in the area to more than 900,000 bbl. (P. 96) . . . Pacific Northwest pipeline has added a big gasoline plant to its holdings through the purchase of Barnhart Hydrocarbon Corp. (P. 99) . . . L.P.G. stocks at the end of November were 59.3 per cent higher than at the same time last year (P. 100).

PLUS THESE TECHNICAL FEATURES: A country-by-country summary of refining capacities and processing operations (P. 105) . . . Europe's largest refinery is continuing to expand. Shell's Pernis plant at Rotterdam now has a crude throughput of 220,000 bbl. daily and a big petrochemical output (P. 188). . . . Refiner's Notebook (P. 205) . . . Questions on Technology (P. 207) . . . and Field Processing (P. 209).

East Gets New Titles

Philadelphia area, already world center of imports, soon will be the biggest refining center, have biggest pipeline

PHILADELPHIA. — The 100-mile strip of Delaware River Valley from here to the bay is already the crude-importing center of the world. A new plant about to go on stream will give it the world's largest refining concentration.

Now the area is ready to add some fancy window dressing to beef up its claim to these world titles. This was underscored heavily by the recent proposal to construct the most elaborate system yet conceived for unloading ocean-borne shipments of oil.

The plan, still not wholly defined, calls for construction of a deep-water terminal at the mouth of Delaware Bay and a 500,000-bbl. crude line from there to Philadelphia.

Refining capacity . . . This area is now the site of six large refineries and one small one. Another big one is under construction. The operating refineries have a combined capacity of more than 780,000 bbl. per day. With the completion of the one now building, it will top 900,000 bbl. per day.

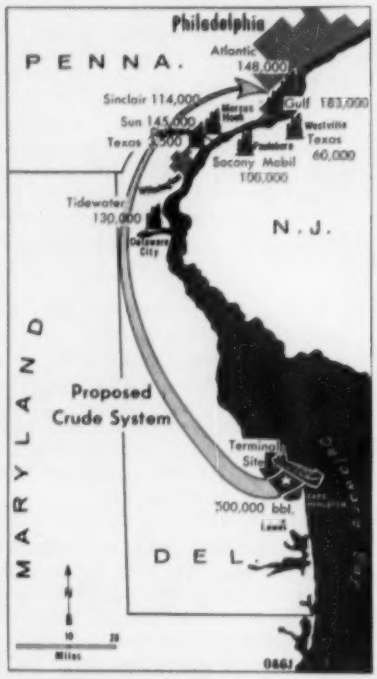
Two of the existing refineries, Gulf Oil Corp., with 183,000 bbl. per day, and Atlantic Refining Co., with 148,000 bbl., are situated within the city limits of Philadelphia.

Two others are located at Marcus Hook, Pa., a dozen miles south of Philadelphia. They are Sun Oil Co., 145,000 bbl., and Sinclair Refining Co., 114,000 bbl.

Two are located across the Delaware River in New Jersey. Socony Mobil Oil Co. has a 100,000-bbl. plant at Paulsboro, and The Texas Co. has a 66,000-bbl. plant at Westville. Texaco also has a 3,500-bbl. refinery at Claymont, Del.

Importance of this area will be enhanced greatly when the now building Tidewater Oil Co. refinery at Delaware City goes into full-scale operation. Completion of this refinery, scheduled for early next year, will add 130,000 bbl. to the area's refining capacity.

Only two of these companies, Sun and Atlantic, are associated with the Cape Pipe Line Co., which will build the terminal and the line. Its incorporators are Sun Pipe Line Co. (Sun Oil Co.), Empire Gas & Fuel Co. (Cities Service), and Atlantic Pipe Line Co. (Atlantic Refining Co.).



EXACT LAYOUT of Delaware River Valley pipeline system is indefinite. Map shows probable site of terminal and approximate route of crude line.

While Cities Service has no refinery in the area, considerable processing is done for it by Gulf. All the refineries are potential users of the proposed facilities.

Biggest importer . . . This area's receipts of crude, all brought in by tanker, are greater than those of any port in the world. About two-thirds of the crude these refineries process is of foreign origin.

Daily average imports of foreign crude into the Philadelphia district this year were 504,684 bbl. This is about 15 per cent higher than the 1955 average of 439,207 bbl.

While the construction details have not been disclosed, it is presumed that the oceanside terminal will be in the vicinity of Cape Henlopen near Lewes, Del. The cape itself could be used as a natural breakwater for the unloading bulkhead.

Supertankers handled . . . It was announced that the bulkhead would be located 4 to 5 miles from shore where the water is at least 50 ft. deep. Since it will have to accommodate several supertankers at one time, it probably will be as much as ½ mile in length. The largest tankers now under construction are more than 900 ft. long.

The present Delaware River channel, only 800 ft. wide at Philadelphia, is 40 ft. deep. Safe depth is regarded as 36 ft. and, normally, no tankers of more than 30,000 d.w. tons are operated that far up stream. Larger vessels have taken crude into the Philadelphia refineries, but only on a rising tide.

Crude would be discharged from the tankers through submarine lines to onshore storage. The region where the terminus of the line is likely to be is not heavily populated so that acquisition of land for a storage farm should not be a major problem.

River crossings . . . Presumably, the line will take the most direct route from Lewes to Philadelphia. This would mean at least two river crossings in Delaware, the crossing of the Chesapeake-Delaware Canal, part of the inland waterways system, and the Schuylkill River in Philadelphia.

Atlantic's Point Breeze refinery is located just north of the Schuylkill. The last 20 miles would be through heavily populated, highly industrialized territory.

Route of the proposed line would pass very close to the new Tidewater refinery. This plant has the least need of all for deeper facilities, since 45,000-ton tankers can readily be handled there.

If the Socony and Texas refineries in New Jersey were to be supplied, a crossing of the Delaware River would be entailed.

The system is expected to cost between $40,000,000 and $50,000,000. Completion date is tentatively scheduled for some time in 1960.

Most important details yet to be worked out are the number of refineries that will use the system and to what extent.

Philadelphia imports . . . Foreign crude coming into the Philadelphia district totaled 504,684 bbl. daily through October. Here's the way it breaks down:

Trinidad, 1,207 bbl.; Netherland Antilles, 437; Colombia, 26,092; Venezuela, 256,191; Iraq, 33,977; Iran, 15,768; Kuwait, 127,803; Saudi Arabia, 26,759; and Qatar, 16,450.

Total imports for all of 1955 amounted to 439,207 bbl. daily. This included Colombia, 21,451; Venezuela, 229,301; Iraq, 19,210; Iran, 7,102; Kuwait, 131,951; Saudi Arabia, 20,374; Qatar, 9,253; and Indonesia, 565.

El Paso Expansion Approved

● But Federal Power Commission wants proof that El Paso will be able to meet California demand after 1958

WASHINGTON. — An $84,658,000 expansion planned by El Paso Natural Gas Co. has been approved by the Federal Power Commission—but with reservations.

The company was ordered to button up its gas supply before it submits any future certificate application.

The 290 miles of pipeline and 56,950 hp. compressor capacity which El Paso will build under its latest permit will allow it to deliver an additional 75 million cubic feet of gas daily jointly to Southern California Gas Co. and Southern Counties Gas Co and another 75 million to Pacific Gas & Electric Co.

The record in the case, however, shows that demand threatens to outstrip supply in El Paso's service area, the FPC pointed out. Requirements of present customers after 1958 will exceed its ability to supply them with gas.

Commissioner Arthur Kline, differing with the other four FPC members over issuance of the certificate, held that El Paso should be required to submit proof of adequate gas availability after 1958 before being allowed to go ahead with its project. The certificate, he said, is contrary to the general rule requiring a 15-year gas supply be shown.

Common equity . . . The FPC also noted that the plan of financing the project will reduce the common equity in El Paso's capitalization from 21.15 to 19.85 per cent. It said that in its next case the company would be given an opportunity to present a financing program showing a "continuing improvement" of common equity ratio.

The additional gas deliveries to the three California companies will include some 50 million cubic feet from the San Juan basin in northwestern New Mexico and southwestern Colorado; 25 million from the Permian basin in Texas, and 75 million also from the Permian basin but secured in exchange for gas from the Panoma field in the Texas Panhandle.

Monopoly charged . . . Meanwhile, El Paso Natural is under attack from California's attorney general because of El Paso's recently-announced plans to absorb Pacific Northwest Pipeline Co., which carries natural gas from the San Juan basin to the State of Washington.

California's Atty. Gen. Edmund G. Brown has asked U. S. Atty. Gen. Herbert Brownell to investigate the possibility of antitrust violation in the proposed merger.

Pacific Northwest's gas line will connect with Westcoast Transmission Co.'s gas line which is being constructed from the Peace River area of British Columbia and Alberta, to the State of Washington. This would make it possible for Canadian gas to flow to California through the El Paso-Pacific Northwest system.

Coming next week: —PETROdatics

YOU'LL want to be ahead, with easy-to-read short articles on electronic computers. This new series, "PETROdatics . . . Applying the Electronic Computer to Petroleum Problems," will start in the January 7 issue.

All divisions of the oil and gas industry will be represented in these articles. Here are some examples:

. . . Exploration: Interpretation of gravity and seismic data.

. . . Production: Depletion and proration calculations.

. . . Refining: Fractionator design, blending problems.

. . . Pipelining: Orifice-meter calculations, determining optimum operating conditions.

Officials of DATICS Corp., a new Dallas firm, will write the articles. The authors have had wide experience collectively in the oil industry and in electronics with Magnolia Petroleum Co., Phillips Petroleum Co., United Gas Corp., Burroughs Corp., and Benson-Lehner Corp.

Here are some of the titles in the new PETROdatics series:

- Isothermal Flash Calculations.
- Processing of Gas Run Tickets.
- Primary Depletion Calculations.
- Compressibility Factors: Benedict-Webb-Rubin.
- Mass Spectrometer Calculations.
- Offshore Exploration.
- Compressor Efficiency Calculations.
- Royalty and Severance-Tax Computations.
- Tank-Table Calculations.
- Geophysical Gravity Factor Data.
- Reserve Estimation.

IRS Changes Rules

Depreciation on rigs now on an operating-day basis

WASHINGTON. — A new yardstick for figuring depreciation of rotary drilling rigs and other production equipment was provided last week by the Internal Revenue Service.

The IRS ruled that where it can be "reasonably" determined that the major factor in depreciation is wear and tear arising from use and obsolescence is not an important factor, depreciation may be computed on an operating-day method.

This will permit the life of a particular piece of equipment to be estimated in terms of the total number of days it can be operated. The depreciable basis will be prorated on the actual number of days used.

The new rule requires establishment of a reasonable salvage value and estimated total operating-day life, subject to subsequent revision in accordance with actual experience. It will also be necessary to show that this method results in a "reasonable" annual allowance for depreciation.

Operators planning to use the new method must apply for permission under the usual procedure for securing consents to changes in methods of accounting.

Rancho Line Boosted

25,000 bbl. added to big West Texas-Gulf carrier

HOUSTON.—The Rancho Pipe Line System will have capacity to move an additional 25,000 bbl. of crude oil per day from West Texas to the gulf starting January 1.

Installation of a new booster station near Katy, Tex., boosts capacity of the 24-in. line from 232,000 bbl. to 257,000 bbl. daily. Originating in the Permian basin, the carrier extends 455 miles to the Houston-Texas City area.

Shell Pipe Line Corp., part owner and operator of the system, has long-range plans for installation of four additional pump stations. These would boost capacity to 360,000 bbl. per day.

The new installation is the first remotely controlled station on the Rancho system. It will be operated from Larfiele station 109 miles to the west *(The Oil and Gas Journal, September 10, page 90)*.

Although the Katy station is not expected to be completed until about March 1 it was due to go into operation January 1.

U.P. Wins Title Battle

Colorado judge upholds railroad's right to oil and gas lease on land-grant property sold to finance its line

STERLING, Colo.—The Union Pacific Railroad has won another challenge to its oil rights on land-grant properties it sold to finance original westward construction of the line.

District Judge George Blickhahn upheld the railroad's title to oil and gas rights. He denied the mineral claims of two Logan County residents who own surface rights to the 160-acre tract in dispute.

The decision involving a small farm in the Denver-Julesburg basin is interpreted as a precedent which might affect mineral rights to huge blocks of land grants in other western states.

The issue . . . The suit was filed by Sara M. Radke and Edward F. Karr. They challenged the railroad's claim to oil rights on their quarter-section of farmland northeast of Crook, Colo.

The landowners had leased the 160 acres in question to Platte Oil Co. of Wichita, Kans. Validity of the lease was denied by the railroad.

Basic point at issue was whether the railroad had legally reserved rights to oil and gas when it transferred title on the land it received from the Government to build the railroad.

The decision . . . Judge Blickhahn ruled the railroad reserved rights "to coal and other minerals." He interpreted "other minerals" to include oil and gas.

Judge Blickhahn rejected arguments by Radke-Karr attorneys that the railroad had sold off unspecified mineral rights when it disposed of the lands in the late 1800's.

The landowners had claimed the presence of oil and gas was not known in the area at time of the property sale. But railroad lawyers had countered that the carrier knew of oil-gas possibilities and had paid mineral taxes to safeguard its reservations.

The land . . . Union Pacific was granted millions of acres of land in the Rocky Mountain area by Congress in 1862 to build a railway.

The land included alternate odd-numbered sections for 20 miles on either side of the right-of-way.

Union Pacific sold much of the land to finance construction of its line. Many deeds stipulated that the railroad was reserving to itself title to "coal and other minerals."

Part of the Radke-Karr suit involved claims that the sale contract for the quarter-section in 1896 to John S. Henrichs of Denver did not contain the "coal and other minerals" clause.

But Judge Blickhahn said the original deed to the property, which did include the phrase "coal and other minerals," took precedence over the sale contract.

The rail line in recent years has been demanding—and getting—15 per cent royalty for oil development on the land-grant properties. This is 2½ per cent above the normal fee. Union Pacific keeps the usual 12½ per cent and gives landowners the other 2½ per cent.

The decision is expected to be appealed to the Colorado Supreme Court. The judge, in anticipation of this, waived new trial motions and gave Radke-Karr attorneys the right to send the trial record directly to the tribunal for review.

Earlier case . . . Judge Blickhahn's decision was the second major victory in 1956 for Union Pacific involving its oil and gas rights.

Last February the U.S. Tenth Circuit Court of Appeals in Denver ruled against the U. S. Government and in favor of Union Pacific. The suit involved rights to minerals under the railroad's right-of-way at Borie Junction, 11 miles west of Cheyenne, Wyo., where U. P. planned to drill for oil.

The Appellate Court upheld a Cheyenne federal District Court ruling which said the federal Government did not retain mineral rights when it granted the railroad the right-of-ways between 1862-64.

Another decision . . . Meanwhile, another railroad, Northern Pacific, last week also won a favorable decision upholding its oil and gas rights to land-grant properties.

The U.S. Ninth Circuit Court of Appeals in San Francisco upheld ruling of U.S. Judge W. D. Murray of Helena, Mont. Theodore B. Russell of Des Moines, Ia., had appealed from Murray's decision.

The Appellate Court agreed that Northern Pacific could legally reserve oil and gas rights on a tract of land in Dawson County, Montana, which Russell inherited from a decedent who acquired it from the railroad.

Russell claimed that the land-grant acts of 1864 and 1870 did not give Northern Pacific authority to reserve oil and gas rights because the railroad was bound by the acts to open the lands to preemption and settlement.

California Stingy This Year

LOS ANGELES.—California operators last week wound up another disappointing year in their search for new oil reserves.

Of the six rank wildcat discoveries during the year, not a single one appears to be commercial. In mid-December the combined output of the six one-well fields was 144 bbl. daily, according to figures compiled by the California Conservation Committee.

To find this amount of new oil production, operators had drilled 135 new-field wildcats. In 1955 the 179 rank wildcats drilled discovered nine new oil fields.

New pools . . . Exploratory drilling in and around known producing structures yielded 29 new oil pools during the first 11 months of 1956. Production of the 139 wells completed in these new pools totaled about 22,000 bbl. daily in mid-December.

The new-pool finds were accompanied by 422 dry holes drilled as outposts or deeper tests in old fields. Thus, the score was one successful well for every 15 tests drilled.

Largest of the new-pool group is the Bridge area of the South Mountain field. There, 14 wells were producing 5,150 bbl. daily. Other new pools of importance include the Santa Fe in Santa Fe Springs, producing 4,200 bbl. daily; one at Honor Rancho with an output of 2,500 bbl.; and a new Miocene pool in northwest Dominguez, producing 2,350 bbl. daily.

Oil production during 1956 is estimated to be down almost 13,000 bbl. daily from the previous year's average. During the first half, output hovered near the 970,000-bbl. mark, but for the last 6 months was off almost 11,000 bbl.

Alaskan Wildcat Planned

DENVER.—Colorado Oil & Gas Corp. will start the first exploratory well on its Alaskan acreage early in February. The company will be joined in the test by Frankfort Oil Co., a division of Calvert Distilling Co.

Drilling will be done under contract by Haney & Williams Drilling Co.,

Long Beach, Calif. Equipment is being assembled for delivery to the site in January.

Location is about 3 miles southwest of the ice-free port of Yakutat near the center of a block of 1,100,000 acres. The acreage in the southeast Alaskan panhandle extends along the Gulf of Alaska from Icy Bay to Cape Fairweather.

The wildcat stemmed from encouraging results of reconnaissance work in the Yakutat area. This included 5 months of geological mapping by seismic, gravity, and surface crews. The well is intended primarily to gain knowledge of the sedimentary section to about 7,500 ft.

Gasoline Plant Sold

Northwest Production buys big plant in Permian basin

HOUSTON. — Northwest Production Corp., a subsidiary of Pacific Northwest Pipeline Corp., has acquired the assets of Barnhart Hydrocarbon Corp., which operates a large gasoline plant in the Permian basin.

Located 8 miles east of Big Lake in Reagan County, Texas, the gasoline plant produces about 25 million cubic feet of residue gas and about 55,000 gal. of liquid hydrocarbons daily.

Capacity of the plant is now being increased by 10 million cubic feet of gas per day. The expansion project also will include an additional 27 miles of gathering system in the Farmer field area of Crockett County. Peak production will be boosted to about 80,000 gal. daily.

The Barnhart plant was built in 1948 by Fish Engineering Corp. Since 1954 it has been delivering dry gas to the El Paso Natural Gas Co. system.

The transaction involved the exchange of about 1½ shares of Pacific Northwest stock for each share of Barnhart stock. C. R. Williams, president of Northwest Production, and J. M. Sappington, vice president of Barnhart Hydrocarbon, said the facilities will continue to operate as a separate entity. The firm will retain the Barnhart name and will operate as a wholly owned subsidiary of Northwest Production Corp.

New officers of Barnhart include Williams, president and director; Ray C. Fish, chairman of the board; Sappington, vice president and director; J. M. Clark, vice president and director; C. C. Cunningham, vice president and director; Leon M. Payne, secretary; and E. E. Tracy, assistant secretary and assistant treasurer.

Carolina Fight Won

Transcontinental group to bring natural gas to area

WASHINGTON.—The battle to serve the Carolina tidewater region with natural gas has been won by Transcontinental Gas Pipe Line Corp. and two utilities it serves.

This apparently will be the outcome after Federal Power Commission Examiner Emery J. Woodall:

. . . Approved Transcontinental's plan to build $50.9 million in new facilities to provide expanded gas service to the East Coast.

. . . Rejected proposal of Trans-Carolina Pipeline Corp., Raleigh, N. C., to serve the Carolina tidewater area in favor of projects outlined by North Carolina Natural Gas Corp., Raleigh, and Carolina Pipeline Co., Greenville.

Woodall's ruling is subject to review by the full commission.

Transcontinental proposed to build 350 miles of pipeline in nine southern and eastern states and would add 12,500 hp. in new compressor facilities. The construction would permit it to boost capacity by 125.9 million cubic feet daily to almost 833 million cubic feet.

More than half of the new capacity would go to North Carolina Natural and Carolina Pipeline. These two intrastate projects already have been approved by their state regulatory bodies.

Trans-Carolina Pipeline's proposition competed with the two intrastate projects *(The Oil and Gas Journal, May 28, page 100)*. Woodall ruled that Trans-Carolina failed to show its proposal would be feasible on economic, engineering, or financial bases.

Tidewater Plant Expanding

AVON, Calif.—Tidewater Oil Co. has just put one new unit on stream and is adding another at its 114,000-bbl. Avon, Calif., refinery. A 24,000-bbl. heavy-oil U.O.P. Unifining unit is now desulfurizing crude naphthas for Platforming feed. It can also handle cracked gas oils and catalytically cracked naphthas. Ability to handle a wide variation of charging stocks permits the plant to shift operations on short notice.

A 22,500-bbl. Houdriforming unit which can be doubled in capacity is under construction. It's half the size of a smaller unit Tidewater is putting up at its 130,000-bbl. Delaware City refinery. The Delaware unit will be equipped with Udex facilities, making it an Isoplus unit.

—— *Industry* briefs

Amerada Petroleum Corp.'s Sheridan County Silurian discovery in northeastern Montana, the 1 Tange, flowed oil at the rate of 2,742 bbl. per day on test of an 18-ft. interval at 9,056-74 ft. and was shut in.

The well was acidized and allowed to flow for 7 hours. Actual recovery was 799.92 bbl. of 39.9°-gravity oil. Flow was on ½-in. choke. The discovery opens first production in Sheridan County, moves Montana production to its northeasternmost point, and is one of the most significant strikes in the Williston basin this year. The test is 29 miles northeast of Northeast Bredette field.

The Louisiana Mineral Board will accept bids January 17 for oil and gas leases on more than 21,600 acres. The acreage, all inland, is mostly submerged. Largest tracts being offered are in the Atchafalaya Bay and Pelican Lake areas.

Five of six leases in Acme field of Clay County, Texas, have been unitized with Miami Operating Co., Inc., designated unit operator. A water-flood program recently approved for the field by the Texas Railroad Commission is expected to recover about 2,500,000 bbl. of oil. Acme produces from the Mobley and Bogtsberger sands.

Texota Oil Co. 1 Goffena, a Mussel-shell County, Montana wildcat, is possibly the biggest Amsden exploratory news in Central Montana since Wolf Springs field was opened in 1955. The wildcat recovered 4,400 ft. of 40°-gravity oil on a 3-hour drill-stem test at 6,278-94 ft. The wildcat is 6 miles southeast of Gage Dome, 3½ miles northwest of the town of Delphia, and 25 miles northwest of Wolf Springs field. Nearest drilling to the 1 Goffena is 4½ miles.

Leach Oil Corp. has a possible dis-covery in the Spearfish (Triassic) formation in Bottineau County, North Dakota. Only other Spearfish production in the state is the one-well Newburg field 7 miles northwest.

The wildcat is the 1 Russell Smith. Operator recovered 350 ft. of 35°-gravity oil on a drill-stem test of 3,425-35 ft. The tester was open 1½ hours and shut in 30 minutes. Recovery included 1,700 ft. of gas in drill pipe and 35 ft. of slightly oil-cut mud. Flow pressure was 75-210 psi.

Interests in the well also are held by Amerada Petroleum Corp., Sun Oil Co., Carter Oil Co., Phillips Petroleum Corp., and Northern Natural Gas Producing Co.

Wanted: A Cold Wave

L.P.G. suppliers caught with stocks up and demand down; build-up due to added storage, steady summer production

WHAT the L.P.G. supplier needs is a lot of cold weather between now and the end of February.

Stocks of liquefied petroleum gas at the end of November were up 59.3 per cent from last year, and the stock reduction during the month was 47.2 per cent less than for November last year.

Total stocks of L.P.G. at plants, terminals, and under ground amounted to 660,402,000 gal. at the end of November this year, compared with 415,468,000 gal. at the same time last year (see chart). Also stocks of liquefied refinery gases moved up to 49,135,000 gal. from 39,984,000 gal. on November 30, 1955.

Data for November this year are from the new report compiled by the Economics Department of American Petroleum Institute. Last year's figures are from the Bureau of Mines.

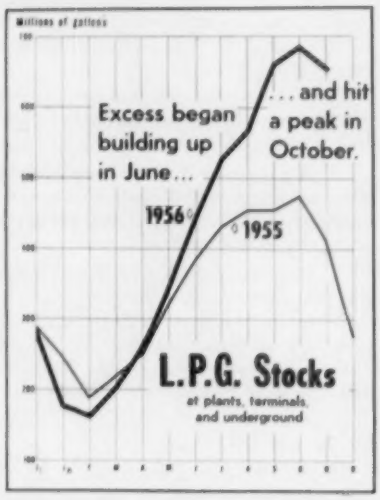
Data from the accompanying table indicate that actual demand for L.P.G. from plants was down a little from November last year. Production this year was 551,079,000 gal. An additional 31,326,000 gal. was taken out of storage for an over-all movement of 582,405,000 gal. Production and stock reduction for November 1955 were 526,858,000 gal. and 59,327,000 gal. respectively for a total of 586,185,000 gal.

These totals represent demand for all L.P.G. produced at plants, including the material shipped to refineries for blending into motor fuel.

The current figures, compiled by A.P.I., are on the same basis as the monthly report by the Bureau of Mines, but there may be some slight variations in the individual company reports. However, the two sets of figures are close enough to show the lack of gain in demand this winter and the big increase in stocks.

Cold weather last winter made it possible to empty most of the underground caverns used as storage. Overall stock levels were considered satisfactory at the end of the season.

Prices hold . . . Price was the big factor in the rapid accumulation of stocks during the past summer. In earlier years, when plant and terminal storage capacity was low, spot prices for propane often dropped to less than a cent a gallon at the plant. These low prices tended to discourage production during the summer months.



The production curve dropped very little this year during the summer. Storage space was available and spot prices remained well above the normal summer level. The extra production went to storage.

The L.P.G. inventory peak for this year came about the end of October, so there will be no storage problems for the remainder of this heating season. However, unless the weather is very cold during January and February, suppliers may have trouble finding a place to put next summer's surplus production.

The cold weather last winter resulted in a stock reduction of 249,000,000 gal. for the 3-month period from December through February, leaving only 166,600,000 gal. in storage.

Even if the weather is cold enough to bring a similar reduction for the December-February period this year, the end-of-season stock level will be about 412,000,000 gal. Such a carryover would limit operations next summer.

Biggest seller . . . Butane accounted for 70 per cent of the stock reduction at plants, terminals, and under ground in November. General market information indicates that shipments for synthetic-rubber production and for blending into motor fuel were important factors in the better-than-average demand for butane.

Part of the increased blending for motor fuel has been due to high motor-gasoline inventories. The refiner who has his tanks filled with gasoline components produced from crude wants to buy the smallest possible quantity of light material for required volatility. Butane is used in place of natural gasoline since a smaller volume is needed for the blend and butane has a high octane value.

However, butane accounts for less than 25 per cent of production at plants. The big-volume product, propane, has not been moving fast enough. Suppliers still need some very cold weather between now and the end of February.

L.P.G.-L.R.G. Production and Stock Changes

(Thousands of gallons)

L.P.G. PRODUCTION

	Nov. 1956	Nov. 1955
Propane	256,433	256,646
Butane	134,695	122,304
P-B mixture	59,041	58,065
Isobutane	40,683	33,692
Other mixture	60,227	56,151
Total	551,079	526,858

L.P.G. STOCK CHANGES

Propane	—10,427	—39,823
Butane	—21,917	—18,001
P-B mixture	485	—3,471
Isobutane	621	2,219
Other mixture	—88	—251
Total	—31,326	—59,327

L.R.G. PRODUCTION

Propane	95,266	73,080
Butane	58,058	37,632
P-B mixture	5,487	8,778
Other mixture	42,556	33,474
Total	201,367	152,964

L.R.G. STOCK CHANGES AT REFINERIES

Propane	—1,141	—2,940
Butane	—1,748	—1,092
P-B mixture	—403	—252
Other mixture	—95	—798
Total	—3,387	—5,082

Gulf Loses Allowable Suit

OKLAHOMA CITY. — Gulf Oil Corp. has lost the first round in its fight against an allowable order of the Oklahoma Corporation Commission. The order compels oil companies to purchase full allowables from their contract wells or ask official permission to cut back if conditions prevent compliance.

A three-judge federal Court here dismissed Gulf's petition for an injunction against the commission order. The court majority ruled that Gulf should first have filed suit in the State Supreme Court.

Gulf had elected to test the order in federal court instead of asking permission to cut back when its market and storage prevented taking full allowables. Gulf contended the order violated its constitutional rights.

Gulf attorneys now are faced with three possibilities in charting their next move: Appeal to a higher federal court, take the case to the Oklahoma Supreme Court, or argue the case at a hearing before the commission.

Jersey Plans Big

Spending in 1957 will be 20 per cent over last year

NEW YORK.—If plans announced by the largest oil company are typical, the oil industry will make another record investment in 1957.

Standard Oil Co. (N.J.) will spend $1,250,000,000 during the coming year—a 20 per cent increase over expenditures in 1956. The Western Hemisphere will get about 80 per cent of the total, and most of the balance will be spent in Western Europe.

Eugene Holman, chairman of the board, said that while demand in the United States is expected to increase about 4 per cent in 1957, demand in the rest of the free world will increase by 8½ per cent.

The new expenditures do not include Jersey's share of nonconsolidated companies of which it owns 50 per cent or less. This spending would add another $130,000,000—up about 15 per cent over 1956.

Holman said effects of the Suez closure on Jersey are serious but are mitigated by the world-wide diversity of the company's interests. Production and purchases elsewhere are making up for the decreased flow from the Middle East.

El Paso Adds Gas Reserves

EL PASO, Tex.—El Paso Natural Gas Co. last week agreed to pay $35,000,000 for 78 gas wells and 125,000 acres of leases in the Texas Panhandle.

El Paso made the deal with Harrington, Marsh & Wagner of Amarillo, Tex., which had a 71 per cent interest in the property, and Murmanill Corp. of Dallas, a Clint Murchison company.

The properties are in Gray, Collingsworth, Wheeler, and Donley counties in the Panhandle.

El Paso plans to lay a 78-mile pipeline from the production to the northern terminus of its north-south line in Moore County and to drill 326 wells on the acreage in the next 4 years.

Pipeline briefs

Marine Pipeline & Dredging, Ltd., expects to complete two double 34-in. underwater crossings of the Assiniboine River this week for Trans-Canada Pipe Lines, Ltd. The contractor is working on bridge crossings of the Fraser and Peace rivers for Westcoast Transmission Co., Ltd., to be completed in the spring. A 50-mile distribution system of lines up to 8-in. has just been completed in Battleford and North Battleford, Sask., for Saskatchewan Power Corp.

Use of positive-displacement meters to measure crude oil delivered from Clay Creek field of Washington County, Texas, to Sun Pipe Line Co. has been approved by the Texas Railroad Commission.

Roy Price, Inc., of Oakland has received the contract for construction of a 225-mile crude pipeline for Union Oil Co. of California from the San Joaquin Valley to Union's Oleum refinery. The project consists of 180 miles of 16-in. and 45 miles of 12-in. Pipe is on hand and construction is to start January 3.

Three spreads will be used on the job, which is to be completed between April 1 and April 15, 1957. Initial capacity of the line will be 75,000 bbl. daily. Addition of booster stations would permit raising capacity to 110,000 bbl. daily. The line will release a tanker from the Avila-to-Oleum run.

The U. S. has more than 188,000 miles of crude and products pipelines in 45 states and the District of Columbia, the Bureau of Mines reported recently in its comprehensive survey of the industry. This system, 91 years after the first successful pipeline—a 5-mile string of 2-in. iron pipe—was laid, is big enough to hold 78,000,000 bbl. of oil.

The bureau's report covers pipeline mileage and capacity by states, diameter of pipe and products handled, broken down for gathering, trunk, and products lines. Copies may be obtained from the distribution section, 4800 Forbes Street, Pittsburgh 13, by referring to I. C. 7769, "Crude-Oil and Refined-Products Pipeline Mileage in the U. S. January 1, 1956."

Southern Natural Gas Co. will complete 24 miles of 12-in. gas line from Lake Enfermer to Gloria, La., by January 1. The company plans to lay 10 miles of gathering lines near Napoleonville and Fort Jackson, La., next summer.

Cape Construction Co., Inc., has shut down city distribution system projects for Cascade Natural Gas Co. in Anacortes, Burlington, and Bellingham, Wash. The systems will be completed in 1957. The company has completed 90 miles of 26-in. for Pacific Northwest Pipeline Corp. from Sumas to Snohomish, Wash., except for cleanup, which will be finished next year.

The second annual Appalachian Underground Corrosion Short Course is scheduled for June 4, 5, and 6 at West Virginia University, Morgantown. The course will cover pipeline and other subsurface metallic corrosion control.

Also for Pipeliners . . .

ODM has turned down the steel industry's proposal for quick write-offs on expansions (P. 92) . . . The 500,000-bbl. crude line planned from the mouth of the Delaware Bay to the Philadelphia refining area will cost between $40 and $50 million and give the area the world's biggest pipeline (P. 96) . . . El Paso Natural Gas has received permission to expand its deliveries of gas into California. But the FPC warned El Paso to submit proof of supplies after 1958 when submitting future proposals (P. 97) . . . Rancho Pipe Line will step up the capacity of its line from West Texas 25,000 bbl. to 257,000 bbl. daily (P. 97) . . . Transcontinental Gas Pipe Line has been granted permission to expand its system to serve the Carolina tidewater region (P. 99) . . . El Paso buys new Texas reserves in $35-million purchase (P. 101) . . . Southern Pacific Pipe Line will start construction in January on a 6, 8, and 10-in. line from San Francisco to Nevada (P. 102).

PLUS THESE TECHNICAL FEATURES: Russia is expanding its natural-gas industry, which is now transporting 300 billion cubic feet of gas a year. Plans call for twice this much by 1960 (P. 178) . . . The first offshore pipeline in the Persian Gulf is being laid by Aramco. It and other facilities going up should put Safaniya, biggest offshore field, on production by April (P. 182) . . . How to figure your pipeline power needs (P. 192) . . . and Pipeline Patrol shows how wound-rotor motors reduce power costs (P. 215).

Microwave Battle Brews

● FCC threat to turn over all private systems to common carriers imperils huge investment by the oil industry

WASHINGTON. — The oil and gas industry is girding for a fight to avert threatened loss of radio facilities on which an estimated $30 to $40 million have been spent.

These are the microwave systems, developed primarily by the pioneering work of the industry. A proposal before the Federal Communications Commission would ban private microwave service and turn it over to common carriers.

Companies using microwave equipment along their pipelines and in other ways are convinced that no common carrier could provide the specialized service required for oil and gas operations. They contend that it is more in the nature of a plant facility than a media of communication.

With the spread of automation, microwave is becoming even more valuable in handling remote operations, including those in the Continental Shelf.

The field for microwave use is broad and steadily expanding. It permits use of telemetering and supervisory controls in addition to normal voice, teletype, and facsimile services.

Airwaves jammed . . . The oil and gas industry was among the very first in this field.

It holds hundreds of microwave permits and today owns nearly as many miles of microwave systems as all other services combined. These have become an integral and vital part of the industry.

The trouble is that other industries also use microwave, and still more want in. Under this pressure, the FCC decided to make a thorough study of the whole matter, including its probable expansion in the years ahead.

Some 19 issues have been raised by the FCC, but the big one, so far as the industry is concerned, is private vs. common carrier operation.

Threat to industry . . . The American Petroleum Institute's central committee on radio facilities was told of the threat in November by Joseph E. Keller, its representative in Washington.

The tremendous investment which the industry has in its present equipment and the elaborate plans for future systems could be imperiled. Keller urged the industry to present a strong and united position for private microwave facilities.

This is of increased importance in the light of growing forces who would deprive the industry of its privately owned facilities and substitute a much less satisfactory common carrier operation, Keller said.

The central committee, headed by Mason Collett of Atlantic Refining Co., has set up a subcommittee to prepare the groundwork for its presentation to the FCC when hearings begin next April 1.

This group already has had 5 days of meetings with FCC staff members. It has talked also with some of the commissioners. Late this month it met with Keller and began drafting testimony to be submitted.

It plans to have some of the issues dealt with at the hearings by the A.P.I. committee. Others will be answered by individual companies. The committee is urging the companies to take part in the hearings as well as industry-related associations. The American Gas Association and the Petroleum Industries Electrical Association, among others, already have filed for appearance at the hearings.

Products Line Slated

Southern Pacific will lay Frisco-to-Nevada pipeline

SAN FRANCISCO. — Southern Pacific Pipe Line Corp. will begin construction in January on the second major products pipeline to be built on a Southern Pacific Railway Co. right-of-way.

The new line will run from the San Francisco Bay area to Reno and Fallon, Nev. A year ago, Southern Pacific Pipe Line, a subsidiary of the railroad, completed a products line from Los Angeles and El Paso to Phoenix, Ariz.

The 350-mile San Francisco-Reno-Fallon line will consist of 6, 8, and 10-in. segments and will be built in four separate sections.

The River Construction Co. of Fort Worth will build 80.7-miles of 8 and 10-in. line between the bay area and a point just west of Stockton. A 58.4-mile segment of 10-in. line between Stockton and Roseville, Calif., will be built by Hood Construction Co. of Lynwood, Calif.

The last two sections consisting of a total of 180.84-miles went to a joint venture of Engineers Limited Pipeline Co. of San Francisco and J. E. Young Pipe Line Contsruction Co. of Los Angeles.

Section three between Roseville and Donner Summit will include 58 miles of 8-in. line and 18 miles of 6-in. line. Section four will consist of 104.39 miles of 8-in. line between Donner Summit and running through Reno to a point near Fallon in Nevada.

Louisiana Moves Up

● State's output will hit just under 1,000,000 bbl. daily during January

BATON ROUGE.—Offshore oil wells are getting the lion's share of production increases authorized by Louisiana to help meet the European fuel shortage.

The January allowable set by State Conservation Commissioner John B. Hussey fixes offshore crude production at 156,852 bbl. per day. Onshore allowable will be 822,174 bbl. daily for a state total of 979,026. The new total is only about 3,500 bbl. per day greater than the December allowable.

Louisiana production allowables have been boosted approximately 230,000 bbl. per day since closure of the Suez Canal, permitting the state to replace California as the nation's second greatest producer.

Percentage gain . . . Since October, offshore allowables have been hiked 48,201 bbl. daily for a gain of 44 per cent. Onshore allowables, although up 181,543 bbl. per day, have risen 28 per cent.

The January schedule for offshore wells will be about 62,000 bbl. per day above actual production in January 1956. This represents a 12-month gain of 65 per cent. Onshore allowables next month will be 188,543 bbl. above production of a year ago for a gain of less than 30 per cent.

Oklahoma Field Unitized

TULSA.—Mount Vernon field in Lincoln County, Oklahoma, has been unitized. Warren Petroleum Corp. is the operator. A secondary-recovery program under the unit plan will be put into operation January 1.

There are 55 oil wells producing from the Red Fork sand in Mount Vernon, which has produced about 2,000,000 bbl. of crude since it was discovered in February 1952. Through unit operation, ultimate production will be increased by an estimated 3½ million barrels. The field's estimated life will be 15 years.

Suez Bypass Planned

Shipbuilder proposes emergency 500,000-bbl. crude line; it would parallel canal and be in operation in 6 months

ARISTOTLE SOCRATES ONASSIS, multimillionaire shipping magnate, is negotiating this week with the Egyptian Government for a deal to build an emergency pipeline paralleling the Suez Canal that would carry 500,000 bbl. of oil daily.

Onassis confirmed his plans for the pipeline last week before leaving New York for Europe. He told newsmen the plan he is now proposing is a change from the one he made the Egyptians a year ago.

Onassis said his pipeline could be completed in 6 months and he doesn't think the canal will be back in normal operation until long after that.

He said he intends to ask six oil companies operating in the Middle East to "lend" 20 miles of pipe each to the project so it can be speeded up. He said the oil companies have "extensive stores" of pipe on hand and they should be willing to supply 20 miles each as an industry gesture.

Onassis added that the pipe would be replaced as soon as it could be purchased.

Savings to industry . . . The shipowner's theory is that the Suez Canal shutdown is costing the world's oil industry $25 million a month. He says he can build his emergency pipeline for $35 million, or about 6 weeks' cost of the present round-the-cape operation.

He said the pipeline could be paid off in 3 years by setting aside two-thirds of the canal tolls normally collected.

He bases this on a toll of 11 cents a barrel for the round trip of a tanker through the canal. He said his pipeline charge would be 9 cents a barrel.

Onassis said he thinks it will be a much longer and more expensive operation than anyone thinks to put the canal back in normal operations.

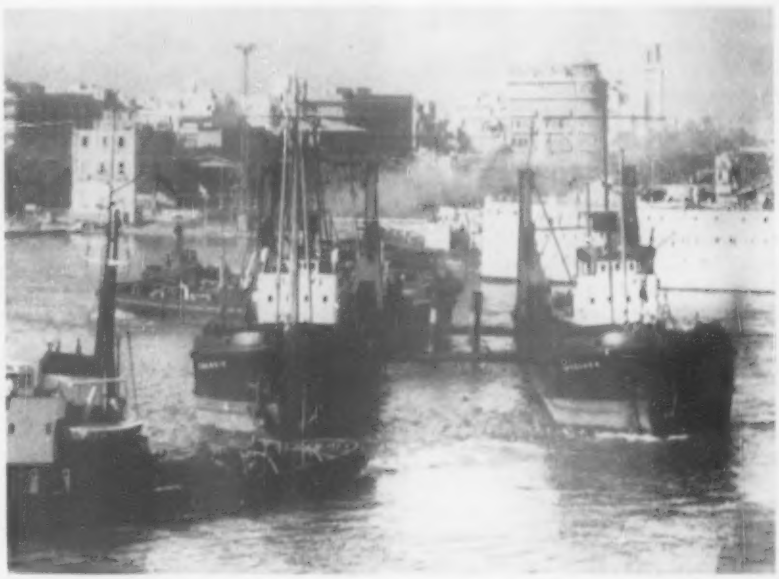
He believes that siltation during the prolonged shutdown will cut the depth of the channel to 25 ft. This is much too shallow for large tankers. Dredging an additional 10 ft. out of the canal will not only take a great deal of time, but it will be extremely expensive, he reasons.

Egypt interested . . . Onassis says he started engineering studies of such a pipeline about 3 years ago and was so impressed by the reports that he filed a formal application with the Egyptian Government to undertake the project a year ago. He said his plan was "well received" by the Egyptian Government at that time.

His original plan was for three parallel 32-in. lines with a roadway and extensive pumping facilities, in addition to housing for personnel and "all the extras."

Much of this would have to be discarded for the emergency line he is now advocating. The revised idea is for only enough pumping capacity to move 500,000 bbl. daily through the quickly-built line.

He points out that 60-ft. water depths at both ends of the canal would make it possible to handle the largest tankers now afloat and says crude storage of 4,000,000 bbl. would have to be built at each end of the canal.



SUNKEN SHIP is being lifted from the Suez Canal at Port Said by two powerful German salvage craft. They originally were chartered and put to work by the British but now are under United Nations control.

Suez Salvage Gets Slow Start

THE British and French have left Egypt. But the job of clearing the Suez Canal so tankers can move Middle East oil to pinched Western Europe is getting under way very slowly.

The departing invaders left their salvage equipment behind (see picture) and tried to persuade the United Nations that it should be used for the job. Egypt at first balked. Nasser's Government wanted no part of Britons in the canal, even if they are trying to put it back into operation.

However, Nasser may have softened this attitude. The U. S. State Department late in the week announced it had received word that work on clearing the canal "will go forward expeditiously."

Promise of quick withdrawal of Israeli troops from Egyptian territory may have influenced Nasser. The United Nations reported Israel has announced its troops would be withdrawn by January 7. Nasser wanted to hold up salvage operations until all invaders were out of Egypt.

Whose equipment . . . The big snag has been just how much of the British and French salvage equipment will be used on canal clearance.

Lieut. Gen. Raymond A. Wheeler, U. S. Army retired, who is in charge of the UN operation, wants to use all

of the equipment. None of these vessels has been any farther south in the canal than El Cap, the limit of British-French penetration.

Wheeler said he would like to use the British and French ships along with German and Dutch equipment chartered by the UN. He proposed to put ships to work at every trouble spot along the entire length of the canal.

The blasted pipeline . . . Talks also began last week in Damascus on repairs to the damaged pipeline in Syria of Iraq Petroleum Co.

Geoffrey Herridge, managing director of I.P.C., came from London with a crew of engineers for the talks. The Syrian Government had asked for the discussions but insisted last week that no oil would move through the system until Israeli forces pulled back to the 1949 Israel-Egypt armistice line.

Pump stations on the 600-mile pipeline system across Iraq, Syria, and Lebanon were blasted when the invasion of Egypt began 2 months ago. The destruction shut off flow of 550,000 bbl. daily of Iraq oil.

Permanent settlement . . . There were hints, meanwhile, in Washington that Nasser may be willing to enter talks on a permanent canal agreement.

Diplomats said talks may begin early in January at UN headquarters in New York. As part of this, American officials privately are urging revival of U. S. plans to help Egypt build the Aswan Dam on the Nile River.

It was American withdrawal of a $55 million loan for the dam that preceded Nasser's nationalization of the canal. This ultimately led to the British-French military action. Any American aid for the dam would be part of a broad economic plan for the Middle East.

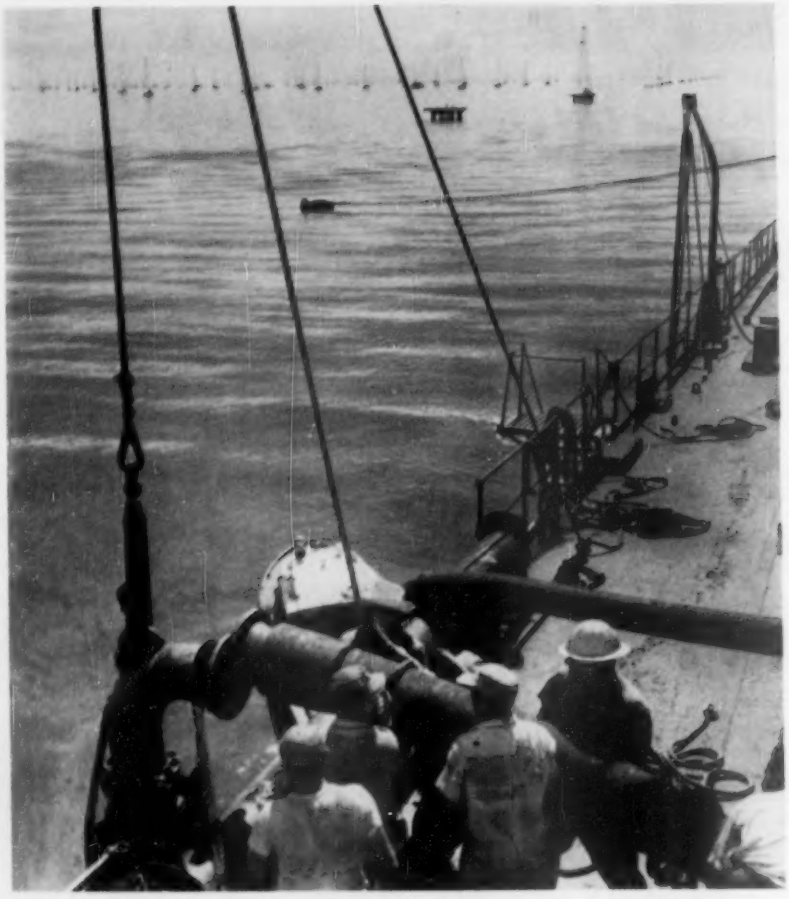
Wildcat Spudded in Ecuador

Manabi Exploration Co., Inc. has spudded a wildcat in a relatively untried coastal area of Ecuador.

The well, 4 Manta, is the company's first deep test on its 40,000-acre Manta concession, located 100 miles north of Guayaquil. The acreage is 90 miles north of Ecuador's present production on Santa Elena Peninsula.

Harold D. Hansen, general manager, said Manabi was encouraged over the prospects of making new discoveries along Ecuador's Pacific Coast since the discovery in Costa Rica several months ago. He said the geology of the areas is similar.

Manabi is a subsidiary of Pan-Israel Oil Co., Inc., and Israel-Mediterranean Petroleum Corp.



Big Tankers Enter Maracaibo

OCEAN-GOING tankers last week were sailing into Lake Maracaibo to load Venezuelan crude at its source.

For years they had tied up outside the lake to load from shallow-draft vessels which brought the oil to them across sand bars which blocked entry to the larger ships.

But a $51-million project has changed all that. A 22-mile ship channel, dredged over a period of several years, has eliminated the costly and time-consuming transfer operation.

Until new terminal facilities are completed, long, flexible underwater pipe is being used to help load the tankers (see photo). Each pipe is marked by a buoy. The tanker hands hoist the buoy aboard, hook up the pipe, and start loading oil.

Venezuela is the world's second largest oil-producing nation, with output last month reaching an all-time high of 2,600,000 bbl. daily. Of this total, nearly 2,000,000 bbl. per day comes from the Maracaibo area *(See special report on Venezuela, beginning on page 142).*

Algeria Claims "Middle East" Producer

THE latest French discovery in the Sahara Desert region of Algeria is being compared with a good producer in the Middle East.

An official of Societe Nationale de Recherche et D'Exploitation des Petroles en Algerie (SN Repal) said last week in Algiers that the well will produce 1,800 to 2,500 bbl. daily from a depth of 11,375 ft.

The discovery, Hassi Messaoud, is 63 miles southwest of Quargla and is in the midde of a vast uninhabited desert more than 500 miles south of Algiers and Mediterranean sea ports. It is almost 400 miles north and to the west of the earlier discovery at Edjele near the Algerian-Libyan border.

The discovery was first revealed more than 3 months ago.

World-Wide Oil

An Annual Report By The Oil And Gas Journal

STATISTICS • MAPS • DISCUSSION • DIRECTORY • ARTICLES

By PAUL SWAIN AND RAY GIBSON, OF THE JOURNAL STAFF

THE Suez Canal crisis and its impact on world oil consumption, crude movement, and production played havoc with statistical trends in 1956. The Middle East, headed for another healthy increase in average daily production of at least 13 per cent, dropped to a gain of only a little more than 3 per cent because of production cutbacks in the last quarter with the canal out of commission. On the other side of the ledger, Western Hemisphere producing countries beefed up already healthy averages to a gain of 9.2 per cent when they were called upon to fill the gap.

Europe and Africa showed a production gain of more than 6 per cent, principally because of increases in crude output in Sicily and France. West Germany's slow but steady oil development pushed her into the top oil producer of Western Europe, supplanting Austria, the country that has long held that spot. The biggest gains for Europe have been in the field of refining capacity. Western Europe showed a gain of 14 per cent in refining capacity in 1956. Projects planned or under way will boost that even higher in the near future.

The Asia-Pacific producing region accounted for a 6.6 per cent increase in daily production and chalked up a 16.6 per cent gain in refining capacity.

The countries behind the Iron Curtain haven't been idle either. The best figures available indicate that this area of the world has increased its oil production by more than 18 per cent during the past year.

Reserves for both the free world and those areas under Russian control have taken another jump. The biggest increases appear in reevaluation of previous reserve figures for the Middle East producing area, aided by several new discoveries in 1956, and in a new look at reserves discovered by continued development in Russia and China.

SUMMARY OF JOURNAL'S NEW SURVEY—Details Start on Page 118

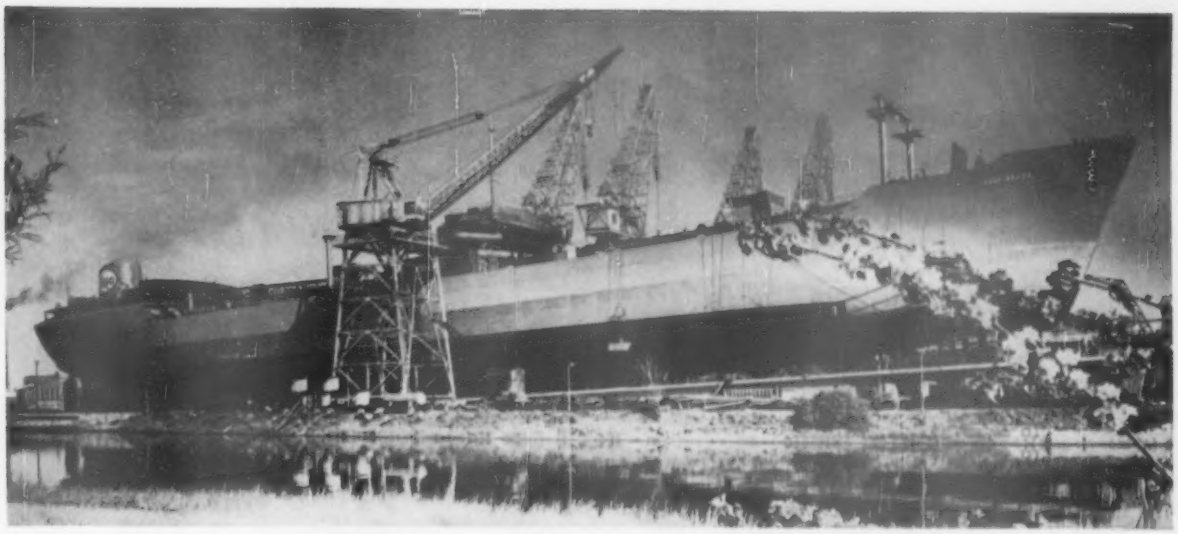
COUNTRY	RESERVES	WELLS		PRODUCTION			REFINING		
	Proved bbl. (1,000's)	Total producing June 1956	Drlg. Sept. 1956	1,000 bbl. per day for 1956	Per cent differ. 1955	Cum. bbl. in 1,000's to 7-1-56	No. oper. refrs.	Cap., 1,000 B/D Crude distillation	Cap., 1,000 B/D Cracking
Western Hemisphere:									
Argentina	400,000	1,350	54	83.1	—0.4	610,153	16	195.9	66.4
Bolivia	70,000	75	12	8.7	17.6	13,651	4	11.7	0
Brazil	40,000	118	16	11.0	100.0	7,573	9	111.3	45.7
Canada	3,500,000	9,619	291	518.0	21.8	738,190	43	751.0	538.0
Chile	25,000	92	5	9.6	35.2	8,438	1	20.0	9.5
Colombia	650,000	1,887	22	120.0	8.1	742,986	3	39.7	35.5
Cuba	4,000	53	10	1.6	45.5	4,008	3	8.7	0.6
Ecuador	25,000	1,585	9	9.7	0	65,021	2	5.6	0
Mexico	2,500,000	1,594	115	253.0	2.6	2,988,785	8	440.0	28.8
Netherlands W.I.	0	0	0	0	0	0	2	650.0	503.0
Peru	275,000	3,270	20	49.8	5.7	483,839	3	46.2	15.2
Puerto Rico	0	0	0	0	0	0	2	37.0	39.9
Trinidad	285,000	2,837	27	79.0	15.7	540,845	3	137.0	55.0
United States	32,873,000	553,500	5,440	7,150.0	5.0	53,917,397	316	9,391.0	6,518.0
Uruguay	0	0	0	0	0	0	1	28.0	2.0
Venezuela	13,200,000	9,499	120	2,481.8	13.6	9,078,033	12	605.3	87.5
Total	53,847,000	585,479	6,141	10,775.3	9.2	69,198,919	428	12,478.4	7,945.1

(Table continued on next page)

SUMMARY OF JOURNAL'S NEW SURVEY (Continued)

COUNTRY	RESERVES	WELLS		PRODUCTION			REFINING		
	Proved bbl. (1,000's)	Total producing June 1956	Drlg. Sept. 1956	1,000 bbl. per day for 1956	Per cent differ. 1955	Cum. bbl. in 1,000's to 7-1-56	No. oper. refrs.	Cap., 1,000 B/D— Crude distillation	Cracking
Europe and Africa:									
Algeria	15,000	45	15	0.6	—45.5	2,240	0	0	0
Austria	395,000	0	24	64.8	—5.0	0	7	45.2	11.5
Belgium	0	0	0	0	0	0	7	138.0	25.0
Denmark	0	0	0	0	0	0	3	1.0	0
East Africa	0	0	5	0	0	0	0	0	0
Egypt	250,000	183	6	32.0	—7.0	235,501	2	70.0	9.2
Finland	0	0	0	0	0	0	1	18.0	0
France	150,000	413	25	25.0	45.4	42,122	13	636.1	108.3
French Morocco	10,000	85	6	2.0	—4.8	4,588	1	2.3	1.8
Germany (West)	454,000	2,878	59	68.0	11.1	191,597	24	302.5	84.3
Italy (incl. Sicily)	150,000	446	47	11.4	165.3	7,187	34	546.0	91.3
Netherlands	115,000	280	7	20.5	4.6	46,505	2	261.0	95.0
Norway	0	0	0	0	0	0	1	1.8	0
Portugal	0	0	1	0	0	0	1	22.9	10.6
South Africa	0	0	0	0	0	0	1	21.1	8.3
Spain	0	0	4	0	0	0	3	110.7	3.5
Sweden	0	0	0	0	0	0	3	45.9	1.0
Switzerland	0	0	0	0	0	0	2	1.8	0
Tunisia	0	0	5	0	0	0	0	0	0
Turkey	65,000	21	5	6.4	93.9	3,262	1	7.4	3.0
United Kingdom	5,000	229	7	1.1	0	7,006	14	631.8	92.3
West Africa	10,000	0	14	0	0	0	0	0	0
Yugoslavia	36,000	0	0	5.0	0	0	3	0	0
Total	1,655,000	4,580	230	236.8	6.4	540,008	123	2,875.0	545.1
Middle East:									
Aden	0	0	0	0	0	0	1	120.0	0
Bahrain	205,000	118	3	30.0	0	181,340	1	205.0	42.7
Iran	30,000,000	73	5	530.0	63.1	2,731,765	3	538.3	30.0
Iraq	22,000,000	91	10	633.0	—8.5	1,517,827	5	46.8	18.2
Israel	50,000	5	10	0.6	0	75	1	85.0	0
Kuwait	50,000,000	200	5	987.0	—9.7	1,968,203	1	30.0	0
Lebanon	0	0	0	0	0	0	2	20.5	0
Neutral Zone	650,000	37	3	41.0	69.4	21,572	0	0	0
Qatar	1,500,000	34	2	127.0	10.8	189,124	1	0.6	0
Saudi Arabia	40,000,000	157	4	1,000.0	3.6	2,497,375	1	189.0	0
Southeast Arabia	0	5	0	0	0	0	0	0	0
Total	144,405,000	720	42	3,348.6	3.2	9,107,281	16	1,235.2	90.9
Asia-Pacific:									
Australia	1,000	0	2	0	0	0	6	182.2	47.7
Burma	45,000	114	2	4.5	9.8	296,000	1	3.0	0
British Borneo	600,000	474	7	116.0	7.6	418,553	1	47.5	0
Formosa	0	0	0	0	0	0	1	28.0	10.0
India	400,000	604	3	9.2	21.8	56,600	3	73.7	18.6
Indonesia	5,000,000	1,449	18	257.0	7.6	1,638,812	5	229.8	10.0
Japan	22,000	3,487	16	6.0	—3.2	96,777	19	293.8	20.4
New Guinea	50,000	53	3	7.2	—23.4	17,655	0	0	0
Pakistan	22,000	0	7	5.1	0	6,482	1	5.0	0
Philippines	0	0	0	0	0	0	1	13.0	5.4
Total	6,140,000	6,181	58	405.0	6.6	2,530,879	38	876.0	112.1
Total free world	206,047,000	596,960	6,471	14,765.7	7.9	81,377,087	605	17,464.6	8,693.2
Russia and controlled areas	*25,000,000			1,850.0	18.3			1,550.0	630.0
Total world	231,047,000			16,615.7	9.7			19,014.6	9,323.2

*Includes U.S.S.R. (23,530,000,000), Romania (600,000,000), Hungary (125,000,000), Albania (20,000,000), China (700,000,000), Czechoslavakia (10,000,000), Poland (15,000,000).



ESSO ARHUS before launching from Odense Staalskibsvaert, Denmark.

A look behind the headlines at . . .

Today's Shifting Tanker Situation

by John J. Winterbottom
Transportation Coordinator
Standard Oil Co. (N.J.)

TO those concerned with marine transportation in the petroleum business, forecasts of future tanker needs, studies of optimum-size vessels for various trades, and other aspects of planning have long been part of every day's work. Headline events of recent months, however, have focused the attention of many others—both within and outside the oil industry—on these ocean-transportation matters. The purpose of this article, therefore, is:

To review certain historical data of interest.

To look at the makeup of the present and projected tanker fleet.

And to forecast possible future industry tonnage supply-demand situations based on our best considered judgment at this time.

The rapidly changing international scene cautions against drawing fine conclusions from this analysis

New Forecast of World Tanker Positions

	T-2 equivalents			
	1956	1957	1958	1959
Estimated year-end tonnage requirements* (after programed new Middle East pipeline capacity)	2,310	2,470±25	2,630±55	2,810±90
Estimated year-end tonnage availability†	2,310	2,535±25	2,750±50	2,950±75
A possible range of surplus tonnage:				
Low-high (T-2)	0	15/115	15/225	Short/305
Low-high (per cent)	0	1-5	1-9	11

*Range in requirements shows effect of an assumed ±1 per cent deviation annually, compounded during 1957 to 1959.

†Memorandum on availability (T-2):

New construction	250±25	250±25	250±25
Scrapping, conversions, etc.	(25)	(35)	(50)
Net addition to fleet	225±25	215±25	200±25

and, thus, the reader is left to add his own interpretation to some of the data presented.

Trends in world-wide tonnage . . . A brief review of historical trends in world-wide industry tonnage utilization (requirements) is of interest in providing a background for projections into the future. Table 1 lists the free-world oil demand for crude and products and the utilization of tankers (6,000 d.w. tons and over) to transport this oil to refineries and markets during the period 1950 to 1955.

The following general observations may be made regarding the historical trends reflected in Table 1:

- **The number of tankers** utilized to carry the world's oil increased significantly each year during the period 1950 to 1955, averaging 10.7 per cent per year.
- **The growth rate** in tonnage utilization was greater each year than the growth rate for oil demand itself. No rigorous year-to-year analysis has been made of this relationship, but over-all it seems that the rapid growth of long-haul oil demand (e.g. Persian Gulf to North Europe and Middle East to Western Hemisphere) is the main cause of this higher growth rate for tonnage.

As shown below, during 1950 to 1955 when tonnage utilization increased by 794 T-2 equivalents, only about two-thirds of this increase (528 T-2's) was due to the increasing world-wide oil demand per se whereas the remaining third (266 T-2's) was attributable to the longer-haul supply pattern during the 5-year period:

	T-2 Equivalents
1950 tonnage utilization	1,217
1950-1955 increases—	
Additional tonnage to meet increasing world-wide oil demand	528
Additional tonnage for longer-haul supply pattern	266
Total increase	794
1955 tonnage utilization	2,011

Table 1—Oil Demand vs. Tanker Use

	Free world oil demand		Tonnage utilization	
	1,000 bbl. per day	Annual increase (per cent)	T-2 equivalents	Annual increase (per cent)
1950	10,050		1,217	
1951	11,130	10.7	1,356	11.4
1952	11,660	4.7	1,496	10.3
1953	12,335	5.8	1,613	7.8
1954	13,050	5.8	1,760	9.1
1955	14,430	10.6	2,011	14.3
Average increase: 1950 to 1955		*7.67		*10.7

*Per cent per year

"In using this forecasting method . . .

. . . it is important to recognize that predictions of future long or short industry tonnage positions are subject to wide swings, due to only modest deviations in each component of the tonnage supply-demand balance."

. . . The growth in world-wide tonnage requirements although not detailed in Table 1, is quite sensitive to oil-demand growth in free foreign areas and decidedly less sensitive to oil-demand growth in the United States. This results from the fact that, roughly, only about 3 to 4 bbl. out of 10 take an ocean ride to satisfy average U.S.A. demand whereas slightly over 7 out of 10 require ocean transportation in the composite free foreign area. Furthermore, the average foreign haul is much longer than that pertaining to the United States. Thus, over-all, the ability to gage correctly future world-wide industry tonnage requirements is dependent largely on the accurate estimation of oil supply-demand balances in the free world outside the United States and to a lesser extent on forecasts of future supply-demand for the U.S.A. itself.

None of these observations regarding past trends is hard and fast. They merely focus attention on certain aspects of the world-wide tonnage picture that should be considered in making the best evaluation of possible future situations.

World tanker fleet . . . As shown on Table 2, the world commercial tanker fleet as of October 1, 1956, numbered 2,320 vessels totaling 40,147,737 d.w. tons equivalent to 2,352.3 T-2 tankers. The T-2 tanker, of 16,600 d.w. tons, 14.6 knots speed, was built in great numbers during World War II in United States shipyards. Currently, as may be determined from the data on Table 2, the size of the average vessel of the world fleet is just about a T-2, having increased each year in the postwar period. Hence, in the statistics presented herein the common unit employed is the T-2 equivalent, for example, a 26,000-d.w. ton, 17.0-knot vessel is 26,000 × 17.0 ÷ 16,600 × 14.6 or 1.8 T-2 equivalent.

The vessels reported under construction or on order as of October 1, 1956, are listed in Table 3 by country of building and with breakdown by contract delivery dates. The 149.4 T-2's remaining for delivery in 1956 represents the total schedule for the year less

(Continued on page 115)

Table 2—Tonnage Breakdown of Today's Tanker Fleet

	U. S. flag			Foreign flag			Total		
	No.	D.w. tons	T-2 equiv.	No.	D.w. tons	T-2 equiv.	No.	D.w. tons	T-2 equiv.
6,000-16,000	44	545,543	30.7	806	9,985,953	495.4	850	10,531,496	526.1
16,001-20,000	253	4,257,017	260.9	792	13,706,656	815.0	1,045	17,963,673	1,075.9
20,001-30,000	30	784,843	52.8	273	6,747,100	421.1	303	7,531,943	473.9
30,001-40,000	10	306,834	21.1	103	3,395,614	226.5	113	3,702,448	247.6
Over 40,000				9	418,177	28.8	9	418,177	28.8
Total	337	5,894,237	365.5	1,983	34,253,500	1,986.8	2,320	40,147,737	2,352.3

Note: Figures as of October 1, 1956, covering ships 6,000 d.w. tons and over, excluding military and U.S.S.R.

The OIL AND GAS JOURNAL

WOR

CANADA

CANADA.—Canadian exploratio
time high and reserves are expan
They stand now at 3 billion barrels
trillion cubic feet of gas.

Production zooms upward, now
500,000 bbl. daily. Predictions ar
reach 1 million barrels a day by 19

Pipelines are thrusting across
both directions—east and west.
these is Trans-Canada gas line, 2,2
from Alberta to Ontario. Pipeline
expected to be $595 million in the n

Refinery and petrochemical cons
ahead. Current capacity is more t
bbl. daily.

UNITED STATES

UNITED STATES.—This country, still the world's greatest oil and gas producer, must in the future look for three new ways to hold its lead position. These are (1) new exploration and development areas, (2) greatly increased efficiencies in primary and secondary-recovery techniques, and (3) offshore reserve areas not now tapped on Gulf Coast and off California.

United States present reserves are on the order of 35,000,000,000 bbl. and exploration people think that much more may be found in new areas and by deeper drilling. Secondary-recovery efforts over future years will add additional large quantities.

The country also leads in refining capacities. Petrochemicals also have expanded greatly in recent years, and will continue to do so in the future.

The country's great pipeline networks will continue to grow. Largest expansion will be in products-pipeline systems and in future natural-gas transmission lines.

CENTRAL AND SOUTH AMERICA

This part of the Western Hemisphere, from Mexico south to Tierra del Fuego, now produces more than 3,000,000 bbl. of oil daily, slightly more than 20 per cent of the free world's oil supply. The bulk of this oil comes from Venezuela where daily production figures are nudging 2,500,000 bbl. The rest is scattered through 10 other Latin-American countries, some of them oil producers for many years.

In almost every country south of the United States border intensive oil exploration programs are under way, either by the world's oil companies or by government agencies. Refining capacity is steadily increasing and a number of major refinery construction programs in this part of the world are not yet started.

CENTRAL AMERICA.—Discovery of oil in Costa Rica—Central America's first—has set off major exploratory programs throughout this region. Guatemala, Honduras, and Panama are all getting a second look after lying dormant for years.

SOUTH AMERICA.—The race for new acreage, much of it semiproved, in Venezuela has brought a number of new companies into the country's mammoth oil industry. Refining conditions attached to the new concessions are certain to mean major increases in the country's refinery capacity as more production is opened up.

Major exploration programs are under way in Bolivia, Colombia, and Peru. In Brazil and Argentina, where the government still jealously clings to the industry, both production and refining still lag behind oil consumption.

CUBA.—The island of Cuba remains one of the most active oil-exploration areas in the Western Hemisphere. Results so far have not kept pace with the enthusiasm of Cuba's promoters, but this has failed to dim the optimism.

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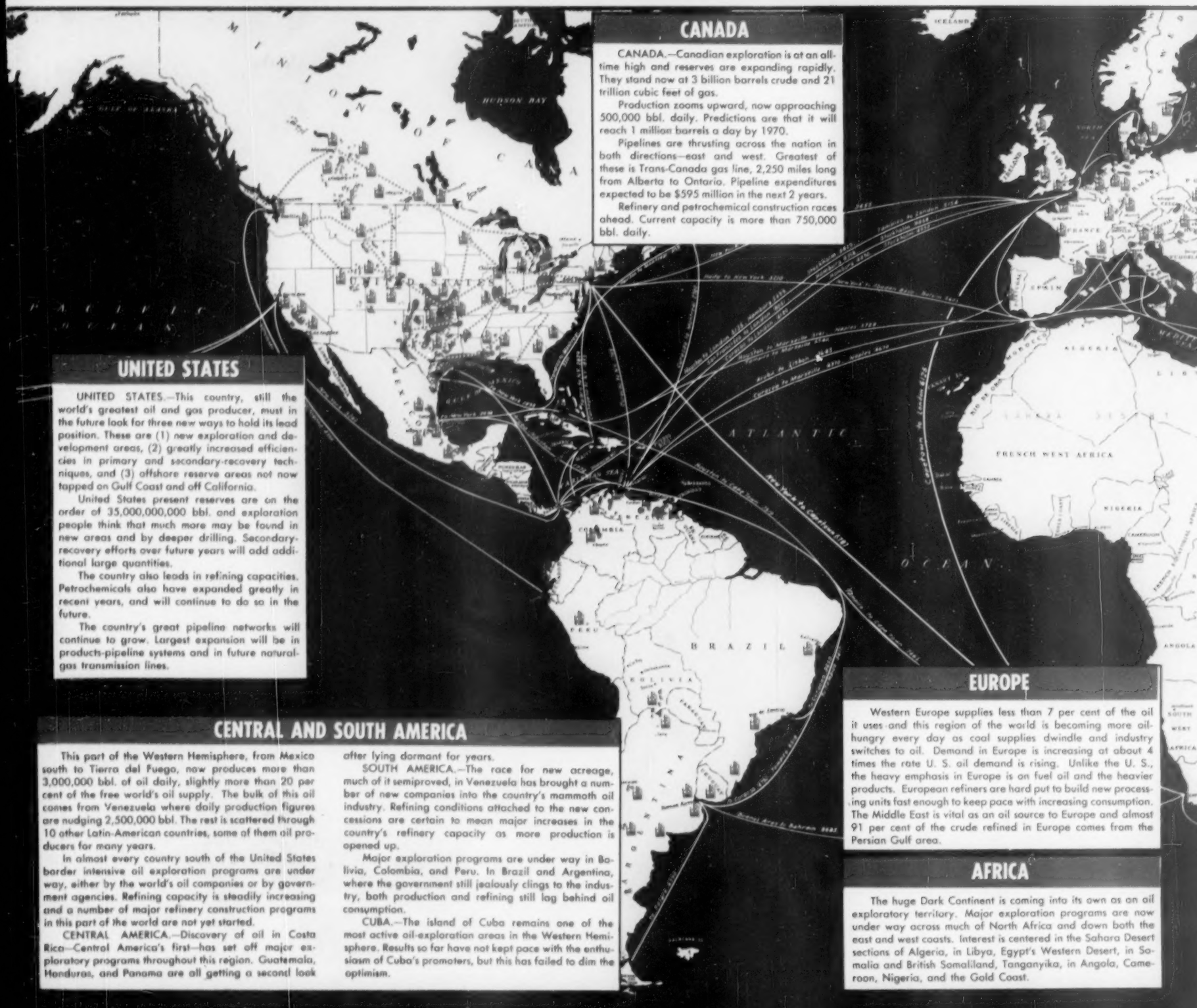
WORLD-WI



CANADA

CANADA.—Canadian exploration is at an all-time high and reserves are expanding rapidly. They stand now at 3 billion barrels crude and 21 trillion cubic feet of gas.

Production zooms upward, now approaching 500,000 bbl. daily. Predictions are that it will reach 1 million barrels a day by 1970.

Pipelines are thrusting across the nation in both directions—east and west. Greatest of these is Trans-Canada gas line, 2,250 miles long from Alberta to Ontario. Pipeline expenditures expected to be $595 million in the next 2 years.

Refinery and petrochemical construction races ahead. Current capacity is more than 750,000 bbl. daily.

UNITED STATES

UNITED STATES.—This country, still the world's greatest oil and gas producer, must in the future look for three new ways to hold its lead position. These are (1) new exploration and development areas, (2) greatly increased efficiencies in primary and secondary-recovery techniques, and (3) offshore reserve areas not now tapped on Gulf Coast and off California.

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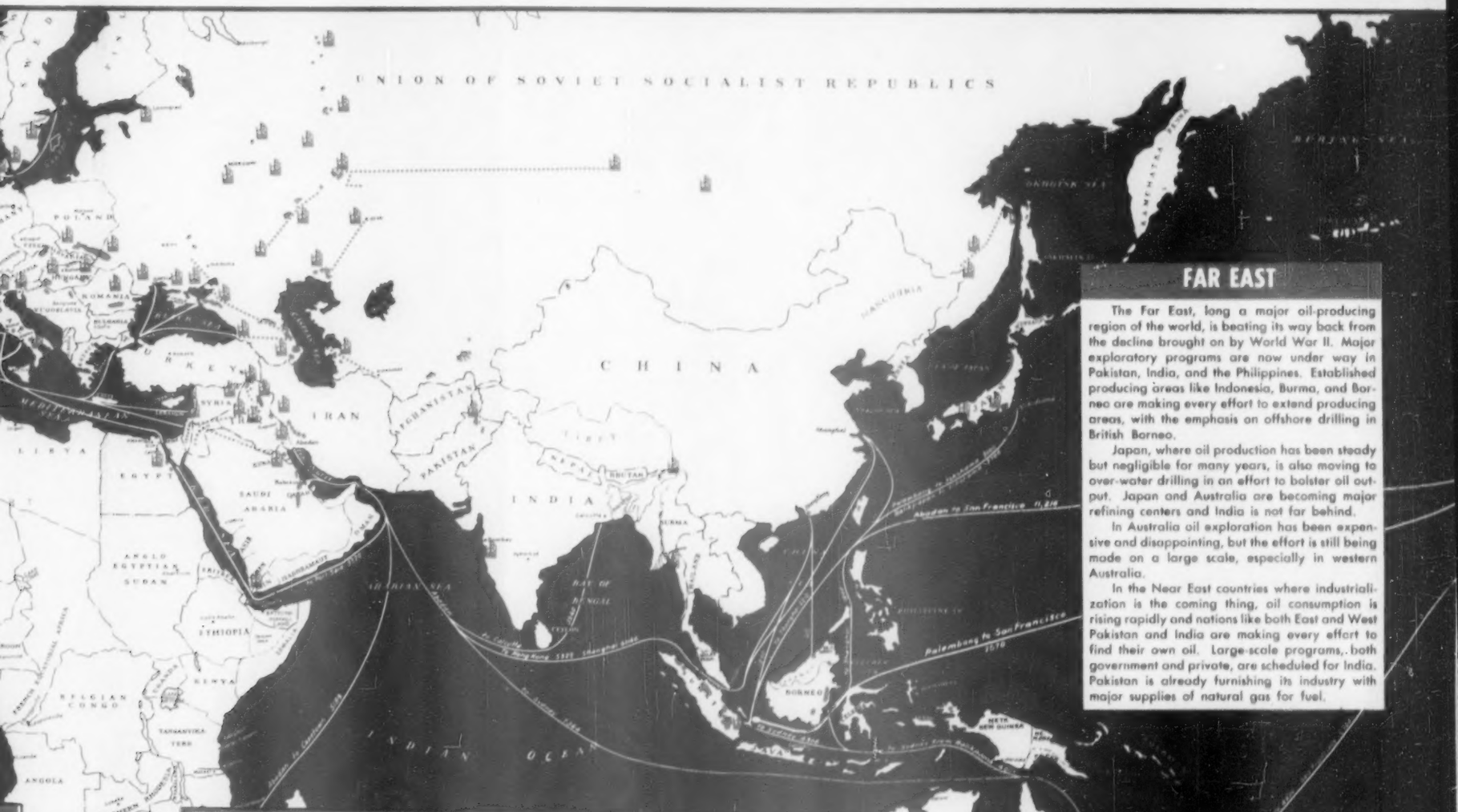
EUROPE

Western Europe supplies less than 7 per cent of the oil it uses and this region of the world is becoming more oil-hungry every day as coal supplies dwindle and industry switches to oil. Demand in Europe is increasing at about 4 times the rate U. S. oil demand is rising. Unlike the U. S., the heavy emphasis in Europe is on fuel oil and the heavier products. European refiners are hard put to build new processing units fast enough to keep pace with increasing consumption. The Middle East is vital as an oil source to Europe and almost 91 per cent of the crude refined in Europe comes from the Persian Gulf area.

AFRICA

The huge Dark Continent is coming into its own as an oil exploratory territory. Major exploration programs are now under way across much of North Africa and down both the east and west coasts. Interest is centered in the Sahara Desert sections of Algeria, in Libya, Egypt's Western Desert, in Somalia and British Somaliland, Tanganyika, in Angola, Cameroon, Nigeria, and the Gold Coast.

IDE-OILARAMA



FAR EAST

The Far East, long a major oil-producing region of the world, is beating its way back from the decline brought on by World War II. Major exploratory programs are now under way in Pakistan, India, and the Philippines. Established producing areas like Indonesia, Burma, and Borneo are making every effort to extend producing areas, with the emphasis on offshore drilling in British Borneo.

Japan, where oil production has been steady but negligible for many years, is also moving to over-water drilling in an effort to bolster oil output. Japan and Australia are becoming major refining centers and India is not far behind.

In Australia oil exploration has been expensive and disappointing, but the effort is still being made on a large scale, especially in western Australia.

In the Near East countries where industrialization is the coming thing, oil consumption is rising rapidly and nations like both East and West Pakistan and India are making every effort to find their own oil. Large-scale programs, both government and private, are scheduled for India. Pakistan is already furnishing its industry with major supplies of natural gas for fuel.

MIDDLE EAST

The Middle East with its prolific producing fields continues to eclipse other oil-producing areas of the world in spite of tinder-box tensions which continue to threaten the future of the region as the major oil supply for Western Europe.

Middle Eastern oil fields produce more than 25 per cent of the free world's oil supply from reservoirs so vast they contain more than 70 per cent of the proved oil reserves of the free world. This supply makes the Middle East vital to an oil-hungry Europe where oil consumption is moving upward in industrial nations that have little or no domestic oil supplies.

Tiny Kuwait and Saudi Arabia each produce more than 1,000,000 bbl. of crude daily and Iran, scene of the area's earliest oil production, has returned to the world-production picture after the fiasco of nationalization. New exploration in all three have found new fields that still have not been fully evaluated. One of the largest offshore fields in the world is about to be put on production in the Persian Gulf off Saudi Arabia and a new onshore field has been discovered in the country. Two wells drilled in northern Kuwait have revealed the existence of another major oil field in that country. The Kuwait Government is offering concessions on Persian Gulf waters offshore and there is every indication that Iran is about to do the same.

In Central Iran, the government oil company has discovered a new field in an area never before productive. It may rival the biggest fields in the Middle East. In Iraq, oil exploration is moving at a less spectacular pace, but production moves steadily upward as the West continues to draw on the older fields and newer ones are developed. Primarily a crude-oil supply source, the Middle East is also boosting its refining capacity. The refinery at Abadan, once the world's largest, is back in operation, and in Kuwait refinery capacity is being increased from 30,000 bbl. daily to 190,000 bbl. daily in one building program.

New pipeline capacity to move this crude supply to ports easily accessible to the shipping of the Western World is to be the next major expansion for this region. The routes of these new lines will depend very largely on the future political climate in the countries the lines will have to cross.

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LEGEND

- OIL FIELDS
- REFINERIES
- PIPELINES

SUPPLEMENT TO THE OIL AND GAS JOURNAL
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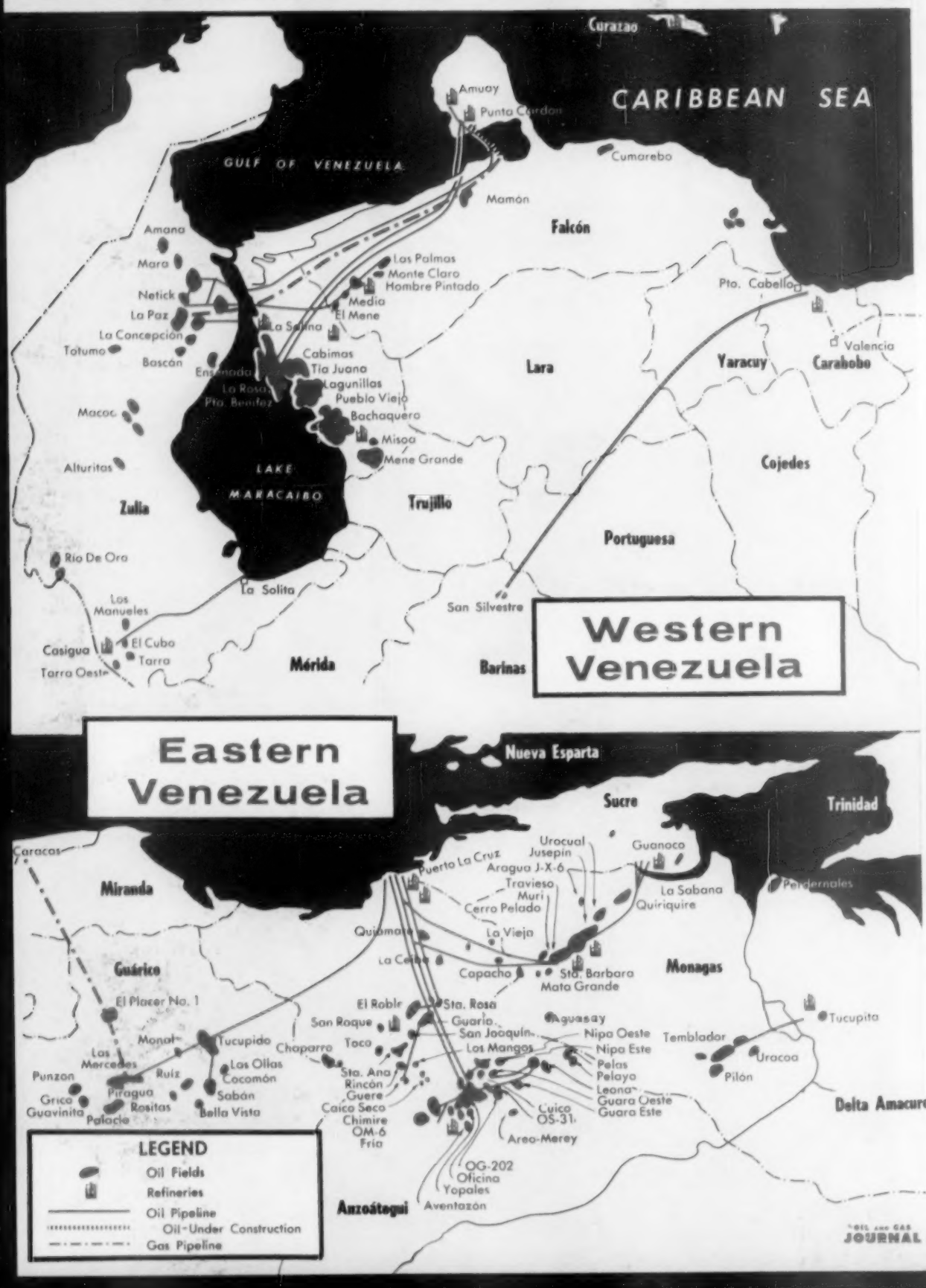
VENEZUELA


Curazao
CARIBBEAN SEA
Amuay
Punta Cardon
GULF OF VENEZUELA
Cumarebo
Mamón
Falcón
Amana
Mara
Netick
La Paz
La Concepción
Totumo
Bascán
Ensenada
La Rosa
Pto. Benitez
Las Palmas
Monte Claro
Hombre Pintado
Media
El Mene
La Salina
Cabimas
Tia Juana
Lagunillas
Pueblo Viejo
Bachaquero
Misoa
Mene Grande
Macoc
Alturitas
LAKE MARACAIBO
Zulia
Trujillo
Lara
Pto. Cabello
Valencia
Yaracuy
Carabobo
Cojedes
Portuguesa
Río De Oro
La Solita
Los Manueles
Casigua
El Cubo
Tarra
Tarra Oeste
San Silvestre
Mérida
Barinas
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Nueva Esparta
Sucre
Trinidad
Caracas
Miranda
Puerto La Cruz
Urocual
Jusepin
Aragua J-X-6
Guanoco
Travieso
Muri
Cerro Pelado
La Sabana
Quiriquire
Pedernales
Quiamare
La Vieja
La Ceiba
Capacho
Sta. Barbara
Mata Grande
Monagas
Guárico
El Placer No. 1
El Roble
Sta. Rosa
Guario
San Joaquín
Los Mangos
Aguasay
Nipa Oeste
Nipa Este
Pelas
Pelayo
Leona
Guara Oeste
Guara Este
Tucupita
Temblador
Uracoa
Pilón
Delta Amacuro
San Roque
Toco
Chaparro
Monat-
Tucupido
Las Mercedes
Ruiz
Las Ollas
Cocomón
Sabán
Punzon
Piragua
Grica
Guavinita
Rositas
Palacio
Bella Vista
Sta. Ana
Rincón
Guere
Caico Seco
Chimire
OM-6
Fria
Cuico
OS-31
Areo-Merey
OG-202
Oficina
Yopales
Aventazón
Anzoátegui
LEGEND
Oil Fields
Refineries
Oil Pipeline
Oil-Under Construction
Gas Pipeline
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MEXICO

PRODUCING FIELDS BY AREAS

Northeastern Area

Azucar
Berrendo
Brasil
Cabeza
Camargo
Cañón
Cañón Oriental
Chapul
Culebra
18 de Marzo
El Pato
Garza
Guillermo Prieto
Jaball
Lajitas
Laredo
La Presa
La Presita
La Tinta
Lomitas
Matamoros
Mexicano
Misión
Rancherías
Reynosa
Río Bravo
Valadeces
V. Cárdenas
Zacate

Tampico-Tuxpan Area

Alamo
Alazán
Allende
Altamira
Acuatempa
A. Camacho
Asunción
Boca de Lima
Cabo Rojo
Cerro Azul
Chichimantla
Cincuenta
Coatzintla
Comales
Ebano
El Chote
Escolín
E. Ordóñez
Furbero
Guerrero
Gutierrez Zamora
H. Galeana
Horcón
I. del Toro
Jardín
J. M. Morelos
Las Cañas
Loma del Pozo
Macarena
Mecatepec
Mesa Cerrada
M. Hidalgo
Moralillo
Mozutla
Naranjos
N. Limón
Nuevo Progreso
Octotepec
P. Alemán
Pánuco
Paso Real
Pitahaya
Poza Rica
San Andrés
San Miguel
Santa Agueda
Solís
Tajín
Tamatoco
Tamaulipas
Tamihua
Tancoco
Tahuijo
Tecolutla
Temapache
Temapache, Norte
Tenexco
Tlacolutla
Unión y Progreso
Zacotla

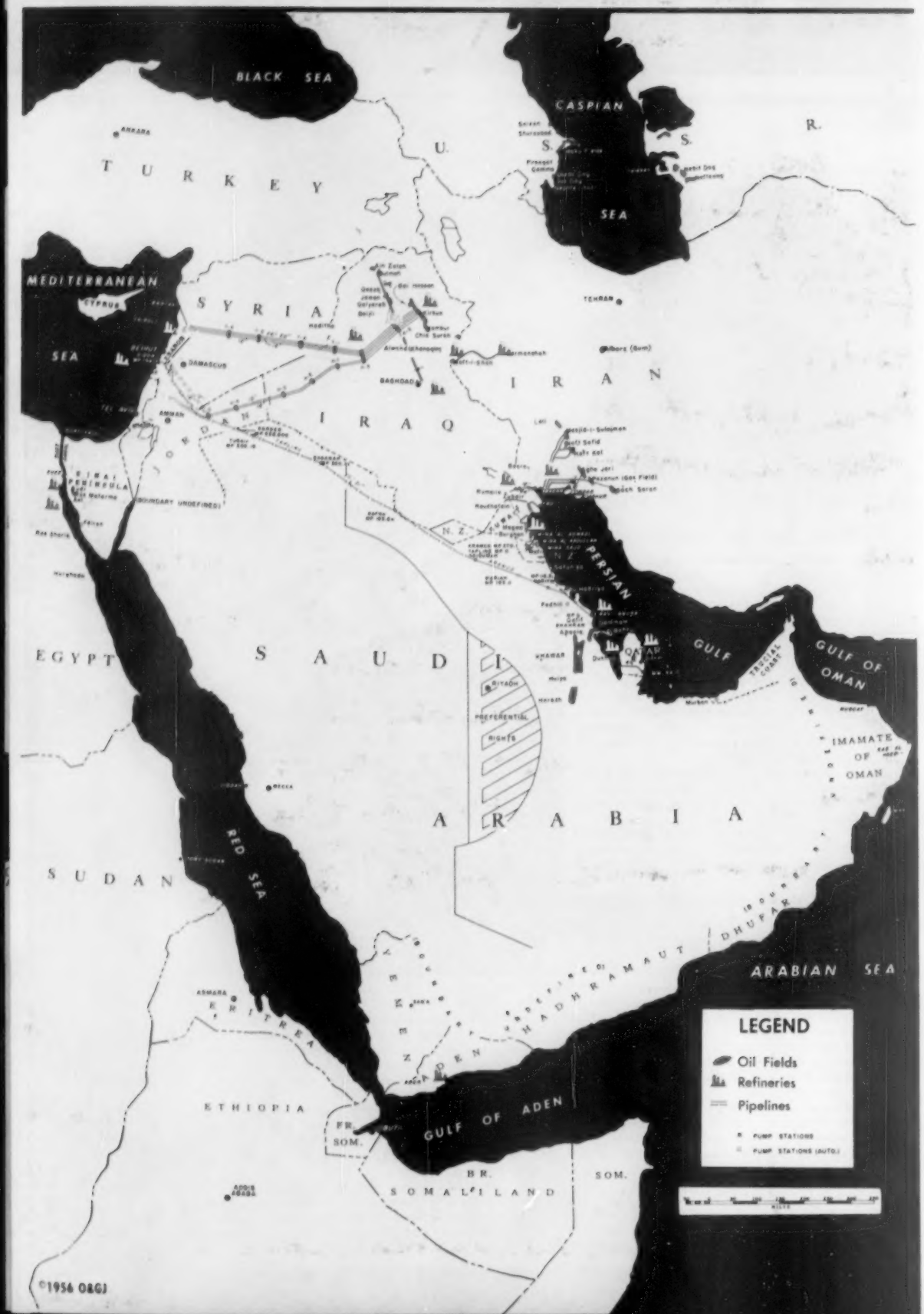
Veracruz Area

Acalapa
Agata
Arroyo Blanco
Bitzal
Chilapilla
Cuichapa
El Burro
El Plan
Encrucijada
Filisola
Fortuna Nacional
Ixhautlán
José Colomo
La Venta
Los Soldados
Moloacán
Morales
Nuevo Teapa
Rabón Grande
Tecuilolapa
Tonalá
Vernet

Southern Area

Angostura
Casa Blanca
Mirador
San Pablo
Tres Higueras

MIDDLE EAST


BLACK SEA
CASPIAN SEA
U. S. S. R.
TURKEY
ANKARA
MEDITERRANEAN SEA
CYPRUS
SYRIA
DAMASCUS
BEIRUT
HAIFA
AMMAN
JORDAN
IRAQ
BAGHDAD
TEHRAN
IRAN
SINAI PENINSULA
BOUNDARY UNDEFINED
N. Z.
PERSIAN GULF
QATAR
EGYPT
SAUDI ARABIA
RIYADH
PREFERENTIAL RIGHTS
GULF OF OMAN
IMAMATE OF OMAN
MECCA
RED SEA
SUDAN
ARABIAN SEA
DHUFAR
HADHRAMAUT
ASMARA
ERITREA
ETHIOPIA
GULF OF ADEN
FR. SOM.
BR. SOMALILAND
SOM.
ADDIS ABABA
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Oil Fields
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the tankers delivered in the 9 months ending in September. It seems probable that some of the remaining deliveries expected this year will slip into 1957.

Whereas only 32 per cent of the existing fleet is now in vessels of 20,000 d.w. tons or larger (Table 2), about 75 per cent of the over-all new buildings are in this category (detailed data shown on Table 4). Thus, the "average vessel" will continue to increase in size each year, the trend being accentuated by obsolescence of the old, small, and consequently less-efficient vessels. Table 5 shows the world tanker tonnage by flag as of October 1, 1956.

Future tonnage positions . . . In the following section, a possible range of future world-wide industry tonnage positions for 1957 to 1959 is discussed. But, first, a few comments regarding bases and methods of forecasting are in order.

The long-term implications of the Suez Canal crisis on ocean-tonnage requirements are impossible to predict precisely and difficult even to confine within reasonable limits at this time. Hence, the forecast of requirements shown reflects Suez Canal routing for all oil "normally" moving via that artery. Furthermore, the projections include normal operation of all existing Middle East pipeline systems with programed increases in throughputs during the forecast period.

In viewing the very short-range world-wide industry tonnage picture, the best technique is a direct gaging of the current situation on tie-ups, new deliveries and scrappage, conversions, etc, together with an extrapolation of these trends for a relatively short period into the future. As shown in the forecast table the 1956 year-end situation (estimated as of October 1, 1956), shows no surplus vessels. Even before the Suez crisis, however, new deliveries from world shipyards were merely keeping pace with the growing demand for tonnage. The low level of tie-ups with which the world industry started 1956 (12 T-2 equivalents) had dwindled to three small foreign-flag vessels (1.1 T-2) as of October 1, 1956.

Dealing with a forecast for a long-range period, the only practical technique is to calculate possible future tie-ups as the difference between two estimates: first, an estimate of tonnage availability, projecting the existing fleet of tankers into the future with estimated new deliveries less probable scrappage and conversions, and, second, an estimate of future tonnage requirements tying in with a forecast of free-world petroleum demand as it requires ocean transportation.

Experience reveals that in using this forecasting method, it is important to recognize that predictions of future long or short industry tonnage positions are subject to wide swings, due to only modest deviations (up or down) in each component of the tonnage supply-demand balance. This fact is illustrated in the forecast table which shows a range of future possible year-end (peak period) tonnage positions for 1957 to 1959. In 1959, for example, a surplus of 140 T-2 equivalents

Table 3—Shipyards are Booked Up Several Years Ahead

Yards—	Number	D.w. tons	T-2 equiv.	Contract delivery dates T-2 equivalent— 1956	1957	1958	1959	1960	1961	1962	Unknown
United States	29	1,066,800	76.4	2.2	26.3	31.4	8.5				7.6
British	169	4,209,430	279.6	44.2	64.8	72.1	54.3	30.8	8.6		4.8
Canadian	1	6,150	0.4		0.4						
Swedish	112	2,870,050	190.7	27.6	36.0	32.9	33.9	16.1	10.0	2.7	31.5
Norwegian	52	1,043,300	69.3	6.2	11.1	15.5	15.0	10.8	9.4	1.3	
Danish	19	466,600	31.0	1.2	7.6	9.4	3.4	3.4			6.0
French	43	1,483,234	98.6	10.5	20.2	24.1	11.1	24.2	4.4		4.1
Spanish	14	245,820	16.3	2.4		1.2	3.4	3.4			5.9
Netherlands	64	1,597,730	106.1	12.3	19.5	22.4	16.2	23.5	6.8		5.4
Italian	47	1,523,276	101.2	5.5	18.2	32.1	29.0	4.8			11.6
Belgian	15	355,150	23.6	2.0	4.5	8.0	7.2	1.9			
Japanese	129	4,614,010	306.5	22.8	115.3	104.7	19.2	6.4			38.1
German	81	2,474,010	164.4	11.4	24.5	37.1	31.0	26.1	3.0		
Portuguese	1	16,700	1.1	1.1							
Yugoslavia	2	50,000	3.3								3.3
Total	778	*22,022,340	1,468.1	149.4	348.4	390.9	232.2	151.4	42.2	4.0	149.6

*In addition to above, the following contracts have been reported as placed, totaling 42 ships, 1,201,000 d.w. tons, and 79.8 T-2 equivalents (actual yards unknown): British yards, 18 tankers, 370,000 d.w. tons, and 24.6 T-2 equivalents; Swedish, 9, 416,000, and 27.6; Norwegian, 3, 57,000, and 3.8; Netherlands, 4, 78,000, and 5.2; Japanese, 6, 204,000, 13.6; and German, 2, 76,000, and 5.0.

Note—Figures represent ships building or on order as of October 1, 1956.

Table 4—Tankers Now Building Will Be Bigger

	U. S. yards— No.	D.w. tons	T-2 equiv.	Foreign yards— No.	D.w. tons	T-2 equiv.	Total— No.	D.w. tons	T-2 equiv.
6,000-16,000				35	449,200	29.9	35	449,200	29.9
16,001-20,000				270	5,024,800	333.8	270	5,024,800	333.8
20,001-30,000	8	211,700	15.3	89	2,169,800	144.1	97	2,381,500	159.4
30,001-40,000	14	480,680	34.5	273	9,408,811	625.0	287	9,889,491	659.5
Over 40,000	7	374,500	26.2	82	3,902,849	259.3	89	4,277,349	285.5
Total	29	1,066,880	76.0	749	20,955,460	1,392.1	778	22,022,340	1,468.1

Note: Construction is shown as of October 1, 1956.

is indicated (2,950 T-2 availability less 2,810 T-2 requirements).

However, suppose that in the 3-year period of 1957 to 1959 inclusive tonnage requirements were to vary ±1 per cent annually (due to demand fluctuations, change in haul pattern, etc.) and, at the same time, net new additions to tonnage availability varied ±25 T-2 equivalents annually. The compounded effects of these variations could cause a huge (89 per cent) variation in the forecasted surplus in 1959.

Thus, the positions in the forecast are indeed sensitive to tonnage-requirment increases that could result from higher than expected increases in oil demand, lengthening of supply routes, etc.—all tending toward the "low side" of the surplus range shown. On the other hand, a falling off in demand growth and major pipeline construction beyond that reflected (e.g. Mediterranean to North Europe) could work in the direction of lowering tonnage requirements.

In closing this article the author believes that one thing can be said with great certainty, namely, that continued analysis of future possible situations will keep the marine-transportation planners busy for some time to come.

Table 5—U. S. Flag Fleet Is Still World's Largest

	Vessels 6,000 d.w. tons and over							Vessels under 6,000	Grand total		
	No.	Steam	No.	Motor	No.	Total	T-2 equiv.	d.w. tons	No.	D.w. tons	Per cent
United States	447	7,784,331	12	183,382	459	7,967,713	503.1	471,475	789	8,439,188	18.69
British	185	3,366,205	319	4,238,158	504	7,604,363	419.2	359,518	720	7,963,881	17.64
Canadian	11	192,441			11	192,441	11.8	77,965	43	270,406	.60
Norwegian	32	622,048	367	6,206,065	399	6,828,113	387.5	102,724	447	6,930,837	15.35
Italian	51	875,722	60	910,438	111	1,786,160	103.9	57,986	149	1,844,146	4.08
French	46	949,607	56	1,013,656	102	1,963,263	117.7	112,931	162	2,076,194	4.60
Venezuelan	13	112,963	1	17,990	14	130,953	6.1	82,287	32	213,240	.47
Netherlands	47	796,989	50	677,107	97	1,474,096	84.0	108,712	139	1,582,808	3.51
Panamanian	121	2,394,781	48	805,562	169	3,200,343	192.6	42,382	179	3,242,725	7.18
German	6	125,551	21	335,294	27	460,845	25.6	65,846	77	526,691	1.17
Argentine	17	210,568	13	194,673	30	405,241	22.5	67,957	56	473,198	1.05
Mexican	10	104,347	7	75,287	17	179,634	7.7	13,026	20	192,660	.43
Greek	12	198,598	1	17,635	13	216,233	12.7	22,305	28	238,538	.53
Brazilian	1	9,000	12	201,730	13	210,730	12.6	36,449	35	247,179	.55
Spanish	4	33,039	22	252,682	26	285,721	14.8	37,010	39	322,731	.71
Cuban								5,452	4	5,452	.01
Chilean	2	34,638			2	34,638	2.0	9,662	4	44,300	.10
Peruvian	1	6,089	1	6,000	2	12,089	.5	17,482	8	29,571	.07
Russian	4	50,530	15	145,299	19	195,829	9.0	78,138	62	273,967	.61
Danish			48	816,751	48	816,751	47.5	4,260	56	821,011	1.82
Honduran	7	166,315	4	59,928	11	226,243	13.4	1,523	13	227,766	.50
Portuguese			7	99,958	7	99,958	5.6	9,283	11	109,241	.24
Turkish	4	62,268	2	28,680	6	90,948	4.7	9,834	13	100,782	.22
Colombian								5,750	2	5,750	.01
Belgian	3	82,455	6	81,799	9	164,254	9.8		9	164,254	.36
Swedish	3	66,402	90	1,472,144	93	1,538,546	90.1	33,604	130	1,572,150	3.48
Finnish	1	11,350	13	187,763	14	199,113	10.5	2,263	16	201,376	.45
Yugoslavian			2	21,710	2	21,710	1.0	4,008	3	25,718	.06
Ecuadorian								2,439	2	2,439	.01
Uruguay	2	33,224			2	33,224	2.0	3,992	5	37,216	.08
Chinese	2	42,960	2	24,628	4	67,588	3.6	17,284	17	84,872	.19
Polish	2	20,885	1	9,481	3	30,366	1.4	2,513	6	32,879	.07
Swiss								440	1	440	.00
Philippine								9,888	8	9,888	.02
Paraguayan								1,015	1	1,015	.00
Moroccan			1	11,910	1	11,910	.6	17,413	18	29,323	.06
New Zealand								3,325	1	3,325	.01
Lebanese								530	1	530	.00
Pakistan	1	9,760			1	9,760	.4	1,100	2	10,860	.02
Costa Rican	1	12,012	1	10,327	2	22,339	.9	1,465	4	23,804	.05
Korean	1	7,420			1	7,420	.4	9,528	4	16,948	.04
Nicaraguan								345	1	345	.00
Australian								697	1	697	.00
Japanese	39	730,904	23	424,299	62	1,155,203	66.5	93,679	121	1,248,882	2.77
Dominican Republic								4,765	2	4,765	.01
Liberian	192	4,669,377	39	646,841	231	5,316,218	337.2	14,777	238	5,330,995	11.81
Thailand								875	1	875	.00
Indian			1	13,125	1	13,125	.7	1,700	3	14,825	.03
Irish								3,350	1	3,350	.01
Iceland								1,685	2	1,685	.00
Egyptian	1	8,700	1	16,900	2	25,600	1.3		2	25,600	.06
Israeli	4	53,473			4	53,473	2.8		4	53,473	.12
South African			1	24,575	1	24,575	1.4		1	24,575	.05
Saudi Arabian	1	46,548			1	46,548	3.2		1	46,548	.10
Total	1,274	23,891,500	1,247	19,231,777	2,521	43,123,277	2,538.3	2,032,637	3,694	45,155,914	100.00

Note: The above includes 27 combination ore and tankships of 544,911 d.w. tons, equivalent to 33.8 T-2's. Figures cover ships 300 gross tons and over, as of October 1, 1956.

PROSPECTIVE OIL AREAS OF THE WORLD

World-Wide Oil Report

Country by Country . . .

• Here, in 46 pages of maps, tables, and text, the Journal gives you a country-by-country report on the international oil picture today. The small index maps help to orient you on the area, and the tables have been condensed to include only the most important figures. The International Oil Directory starting on page 157 lists companies operating outside the United States and Canada, with brief descriptions of their operations, and names of their principal officers.

Abbreviations Used In Tabulations . . .

FCC = Fluid catalytic cracking
TC = Thermal cracking
Vis = Visbreaking
V = Vacuum distillation
TR = Thermal reforming
CR = Catalytic reforming
Alky = Alkylation
Poly = Polymerization
Pf = Platforming
CH = Catalytic hydrogenation
A = Asphalt
Sova = Sovaforming
L = Lube
TCC = Thermofor catalytic cracking
Ct = Catforming
Hd = Houdriflow
PD = Perco desulfurizers
Hf = Houdriformer

MIDDLE EAST . . .

BAHRAIN

• Crude production on Bahrain continued to average 30,000 bbl. daily this year. The operating company, Bahrain Petroleum Co., Ltd., a member of the Caltex Group, completed nine out of nine development wells as producers the first half of 1956. Eleven more development wells were scheduled for drilling by the end of the year in the program to maintain the present level of output, stabilized since 1948. No deep wildcats were drilled.

Expansion continued at the company's 204,000-bbl. daily refinery. But the original building program, planned in 1954, was reappraised last year due to changing requirements in Eastern

BAHRAIN PRODUCTION

Name of field and discovery year—	Proved acres	Depth (ft.)	No. wells— Flow.	Pump.	Production, bbl.— Daily	Cumulative	Gravity, °A.P.I.
Bahrain Zone, 1932	11,700	2,200	114	...	29,200	178,888,003	33.0
Fourth Pay, 1936	3,700	4,500	4	...	800	2,451,913	36.0
Total			118	...	30,000	181,339,916	

EGYPT

• Egypt's oil activities came to a standstill this year after the country's invasion and the world-shaking sabotage of Suez Canal.

The domestic oil troubles were a drop in the bucket compared with the international political furor, the problems of supplying Europe with oil, and the economic loss to Persian Gulf producing countries. But locally, all producing fields were shut down and exploration in the Western Desert halted. Egypt also was cut off from about 17,000 bbl. daily from Soviet ports which was delivered at Suez, on the south end of the canal.

EGYPT PRODUCTION

Name of field and discovery year—	Proved acres	Depth (ft.)	No. wells— Flow.	Pump.	Production, bbl.— Daily	Cumulative	Gravity, °A.P.I.
Asl, 1948	...	2,870-3,870	6	2	3,204	24,963,065	22
Belayim, 1955	...	5,100-8,700	7	...	5,100	1,869,786	22-23
Feiran, 1949	...	6,800	4	...	500	171,462	26
Gemsa, 1908*	...	400-2,000	...	...	...	1,444,056	41
Nurghada, 1913	...	700-2,500	...	23	779	38,934,667	22-30
Ras Gharib, 1938	...	1,200-2,500	8	117	21,589	140,877,651	25-26
Ras Matarma, 1948	...	1,940-3,200	1	1	327	308,339	17-18
Sudr, 1946	...	1,500-3,100	6	8	5,886	26,931,936	19-23
Total			32	151	37,385	235,500,962	

*This field produced 1,591 bbl. in 1 week in January, for use on Egypt's road construction.

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Hemisphere markets. The second vacuum unit, the second fluid catalytic cracking unit, and a new polymer plant were deferred in order to expedite a new 10,000-bbl.-daily Platformer, which is due for completion next year. A 10,000-bbl.-daily catalytic hydrogenation unit also is scheduled to go on stream next year. Refinery runs consist of domestic crude and Saudi Arabian crude, brought in by a 34-mile pipeline, part of which lies under the Persian Gulf.

The Bahrain concession was granted by an independent shaikh protected by the British Government. There were reports of civil disturbances at the time of the Suez crises and British troops landed on the island. But no damage to company facilities was reported at the time.

BAHRAIN REFINING

Company—Refinery location—	Bbl. per stream day: Crude dist.	Cracking	Other processing
Bahrain Petroleum Co., Ltd.: Bahrain*	205,000	15,700 TC 27,000 FCC	V-30,000, TR-19,500,[1] Pf-10,000,[1] CH-10,000, Poly-2,000,[2] A-114,000
Total	205,000	42,700	

*All figures on calendar-day basis. (1) On stream in 1957. (2) Long tons per year.

Domestic crude production was on the upswing for the first time in 3 years at the time operations halted. The rise in output was due to gains in the newly developed Belayim and Feiran fields in the Sinai Peninsula. The fields are operated by International Egyptian Oil Co., Inc., in which the Belgium company, Petrofina, and the Italian government company, AGIP, are the larger owners.

Output in the fields rose to 6,900 bbl. daily in September. This offset the gradual decline in fields held by Anglo-Egyptian Oilfields, Ltd., and Socony Mobil Oil Co., Inc. Royal Dutch-Shell is operator for Anglo-Egyptian. The government and British Petroleum Co., Ltd., also have an interest. Anglo-Egyptian has sole interest in Ras Gharib and Hurghada fields on the western edge of the Red Sea. The company and Socony Mobil each have half interest in three Sinai fields, Ras Sudr, Asl, and Ras Matarma.

Three rigs were wildcatting in the Western Desert this year, on a concession held by Sahara Petroleum Co. The company is owned by four American independents, Continental Oil Co., Cities Service Co., Ohio Oil Co., and Richfield Oil Corp. The first test, 28 miles south of Alexandria, was abandoned at 13,300 ft. after no commercial shows were found.

The October crises also killed hopes that Egypt might soon grant concessions on 131,000 sq. miles in the Nile Delta, Sinai, and the desert east of the Nile. Bids had been opened in April on proposals under the revised mining law.

EGYPT REFINING

Company—Refinery location—	Bbl. per stream day: Crude dist.	Cracking	Other processing
Anglo-Egyptian Oil Fields, Ltd.—Suez*	44,000	6,500 TC	[1]CR-2,300
Raffinerie de Petrol du Gov't.—Suez	[2]26,000	2,700 TC	P-300, A-700, V-1,500
Total	70,000	9,200	

*Figures on calendar-day basis.
(1) Due on stream late 1957. (2) A 32,000-bbl. crude unit planned along with 5,000 bbl. vacuum distillation, 1,100 bbl. lube-oil plant and another 2,000-bbl. asphalt unit.

IRAN

● Iranian crude production is regaining ground lost during 3 years of nationalization.

In October, 2 years to the month after the government and a consortium of eight companies came to an operating agreement, Iranian Oil Exploration & Producing Co. produced 634,000 bbl. daily in southern Iran. This level was approaching the best months of prenationalization days.

The Suez Canal closing late in October caused a 25 per cent reduction in output. Until then, output had averaged 536,000 bbl. daily for the year. This did not include another 4,000 bbl. daily produced in northwestern Iran by the government's National Iranian Oil Co. (N.I.O.C.).

The country's refining industry is not doing as well. Runs to stills at the 514,000-bbl.-daily capacity Abadan refinery are only about 41 per cent of crude production. This comparatively low level of intake is due to the new refineries built, in importing countries during nationalization.

The most stirring discovery in the

IRAN PRODUCTION

Name of field and discovery year—	Proved acres	Depth (ft.)	No. wells Flow.	No. wells Pump.	Production, bbl. Daily	Production, bbl. Cumulative	Gravity, °A.P.I.
Agha Jari, 1937	39,040	4,900-9,800	23	...	403,444	619,710,000	34.8
Gach Saran, 1928	19,200	2,800-6,150	1	...	231	130,765,000	31.8
Haft Kel, 1928	19,200	1,900-4,000	15	...	96,988	1,033,650,000	38.3
Lali, 1938	25,600	4,000-9,000	5	...	7,134	18,780,000	37.2
Masjid-i-Sulaiman, 1908	28,800	640-3,600	19	...	44,017	887,700,000	36.7
Naft Safid, 1935	19,200	3,000-6,000	7	...	20,815	41,160,000	35.2
Naft-i-Shah, 1923*	....	5,000	2	....	†3,400	.....	35.0
Alborz (Qum), 1956‡	....	7,800	1	....	.....	.....	
Total			73	...	576,029	2,731,765,000	

*Operated by National Iranian Oil Co., government owned. †Estimated. ‡N.I.O.C. wildcat blew in last August, flowing estimated 80,000 bbl. daily.

ISRAEL

● Israel's small Heletz field grew in economic importance late this year when Russia stopped shipment of oil supplies, which had accounted for about one-fifth of the country's imports.

Intense development of Heletz is under way and output is expected to reach 2,800 bbl. daily in February. Near the end of the year, there were six flowing wells in the field. Three more producers needed tubing in order to be completed. As part of the speedup program, two rigs contracted from other companies were being added to the five in the field. Choke

ISRAEL PRODUCTION

Name of field and discovery year—	Proved acres	Depth (ft.)	No. wells Flow.	No. wells Pump.	Production, bbl. Daily	Production, bbl. Cumulative	Gravity, °A.P.I.
Heletz, 1955	....	4,900-5,600	*5	....	600	75,000	32.0
Total			5	....	600	75,000	

*Four wells shut in awaiting tubing.

QATAR

● Qatar, the largest of the smaller Middle East producing areas, made further gains this year with output in peak months passing 130,000 bbl. daily.

Production from the 100-mile by

QATAR PRODUCTION

Name of field and discovery year—	Proved acres	Depth (ft.)	No. wells Flow.	No. wells Pump.	Production, bbl. Daily	Production, bbl. Cumulative	Gravity, °A.P.I.
Dukhan, 1940	....	6,500	34	...	128,000	189,124,000	41.5
Total			34	....	128,000	189,124,000	

world's industry this year was made by N.I.O.C. in northern Iran near Qum. The 5 Alborz erupted as an old-fashioned gusher in August. The well ran wild for weeks flowing an estimated 80,000 to 150,000 bbl. daily. Even after successful capping, the well was permitted to flow through a 4-in. flow line as a safety measure. Preparations were under way for drilling a relief well when the discovery bridged and shut itself off in November.

IRAN REFINING

Company—Refinery location—	Bbl. per stream day: Crude dist.	Cracking	Other processing
Iraanse Aardolis Raffinage Maatschappij, N.V. (Iranian Oil Refining Co.):			
Abadan	[1]514,000	30,000 FCC	V-69,000, TR-82,500, Alky-11,000, L-400, A-5,100
Masjid-i-Sulaiman	[2]20,000		
National Iranian Oil Co.—Kermanshah	4,300		
Total	538,300		

(1) Refinery operating at about 223,000 bbl. daily. (2) Topping plant. Output used locally.

LEBANON REFINING

Company—Refinery location—	Bbl. per stream day: Crude dist.	Cracking	Other processing
Iraq Petroleum Co., Ltd.:			
Tripoli	11,550		
Mediterranean Refining Co.:			
Beirut, Sidon*	9,000		Pf-1,120
Total	20,550		

*All figures on calendar-day basis.

Wildcatting is under way for the first time in 5 years. Iranian Oil Exploration is drilling its first test at Ahwaz, 40 miles south and west of Naft Safid and 60 miles north and west of Agha Jari fields.

Iranian Oil Exploration is one of the two operating companies in Iran under the consortium agreement. Iranian Oil Refining Co. is the second firm. The parent for the operating companies is Iranian Oil Participants, Ltd. Its shareholders consist of the eight companies in the original agreement, plus nine others which divided a 5 per cent interest transferred from initial American participants.

British Petroleum Co., Ltd., holds 40 per cent; Royal Dutch-Shell, 14 per cent; and Cie. Francaise des Petroles, 6 per cent. Companies with 7 per cent interest are Standard Oil Co. (N. J.), Socony Mobil Oil Co., Inc., Gulf Oil Corp., The Texas Co., and Standard Oil Co. of California.

The nine other companies are all U. S. firms.

size on the producing wells also was raised, from ⅞ in. to ¼ in.

The Heletz discovery a few miles from the Gaza Strip in October 1955 was the first find in widespread exploration under way since the country's inception. The field is operated jointly by Israel Prospectors Corp., Ltd., and Lapidoth Israel Petroleum Corp., Ltd. Several other companies are active in the country, although American drilling crews on some rigs went home after hostilities broke out between Egypt and Israel in October. Among the other companies are Pan-Israel Oil Co. and Israel-Mediterranean Petroleum, Inc., operating jointly, Israel Continental Oil Co., Israel American Oil Corp., and Naphtha Israel Oil Co. At least seven wildcats were drilling at one period late in the year, with activity concentrated in the Dead Sea area, near Haifa, and in the general vicinity of Heletz.

Israel's domestic products needs are refined at the 85,000-bbl. daily Haifa refinery, owned by Royal Dutch-Shell and British Petroleum Co., Ltd., which is operated at less than 25 per cent capacity. A crude line from Iraq terminating at the refinery has not been used since 1948. Heletz crude is shipped to the refinery by a 5-mile pipeline to a railroad, and then by tank car.

ISRAEL REFINING

Company—Refinery location—	Bbl. per stream day: Crude dist.	Cracking	Other processing
Consolidated Refineries, Ltd.—Haifa*	85,000		TR-20,000, A-1,000
Total	85,000		

*Refinery being operated at less than 25 per cent of capacity.

80-mile shaikhdom jutting into the Persian Gulf comes from a single field, Dukhan. Operations are handled by Qatar Petroleum Co., Ltd., a member of the Iraq Petroleum Co., Ltd., group, which has a concession over the mainland and territorial waters.

Royal Dutch-Shell is continuing its offshore drilling program from a movable platform in the Persian Gulf. The second test was started this year 40 miles out. A wildcat drilled last year was unsuccessful. Shell acquired its concession in 1952 from Superior Oil Co.

QATAR REFINING

Company—Refinery location—	Bbl. per stream day: Crude dist.	Cracking	Other processing
Qatar Petroleum Co., Ltd.:			
Umm Said	600		
Total	600		

IRAQ

● Iraq is the hardest hit of the Middle East producing countries affected by the current crises.

The Iraq Petroleum Co., Ltd., pipeline system to the Mediterranean was sabotaged in Syria shortly after the Suez Canal closed, and no firm progress had been made near year's end toward getting repairs under way. The system normally transports more than 500,000 bbl. daily of crude, most of it from Kirkuk field in northern Iraq.

Replacement or repair of blown-up pumping stations on the 12 and 16-in. set of lines to Tripoli, Lebanon, and a 30-32-in. line to Banias, Syria, would take at least a year. But bypasses around the damaged stations would permit 40 per cent throughput, with pressure derived from undamaged stations in Iraq. The temporary bypasses could be installed fairly quickly.

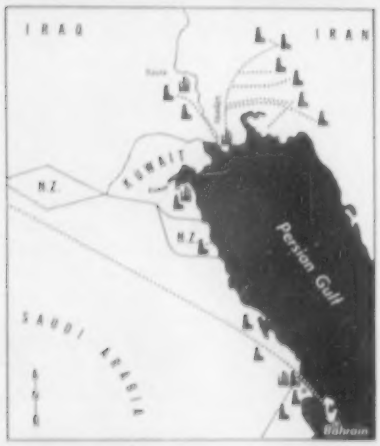
Meanwhile, Iraqi crude production is limited to domestic needs, and to curtailed offtake at the shallow-draft port of Fao on the Persian Gulf. The port is the export terminal for crude from fields in southern Iraq, which

IRAQ PRODUCTION

Name of field and discovery year—	Proved acres	Depth (ft.)	No. wells— Flow.	Pump.	Production, bbl.— Daily	Cumulative	Gravity, °A.P.I.
Ain Zalah, 1939		6,050	4		20,000	30,750,000	31.7
Bai Hassan, 1953		4,800	*6				
Butmah, 1952		3,750		3	6,000	4,481,000	29.5
Jambur, 1954		5,700	*2				
Kirkuk, 1927		2,750	47		520,000	1,265,676,000	36.0
Naft Khaneh, 1923	4,000	3,000	2		5,053	54,971,000	41.0
Rumaila, 1953		10,850	8		85,000	34,174,000	34.7
Zubair, 1949		11,000	27		88,000	127,778,000	36.0
Total			88	3	724,053	1,517,827,000	

*Not yet on production.

KUWAIT



● Kuwait held its own as the world's fourth ranking oil producer this year, at least until the Suez Canal closing in October resulted in sharp curtailment in production.

Output averaged 1,174,300 bbl. daily the first 10 months of 1956 from Burgan and Magwa-Ahmadi fields. This was a gain of 6.8 per cent over the same period last year. The little desert shaikhdom now has produced more than 2 billion barrels since the first barrel of crude was exported 10 years ago.

Kuwait Oil Co., owned jointly by Gulf Oil Corp. and British Petroleum

KUWAIT PRODUCTION

Name of field and discovery year—	Proved acres	Depth (ft.)	No. wells— Flow.	Pump.	Production, bbl.— Daily	Cumulative	Gravity, °A.P.I.
Burgan, 1938		3,500-4,800	147				31.9
Magwa-Ahmadi, 1952		3,500-4,800	53				31.9
Raudhatain, 1955		9,000-10,000	(*)				
Total			200		1,169,822	1,968,202,949	

*New two-well field not yet on production.

NEUTRAL ZONE

● The unusual setup in the Persian Gulf territory continued to hold interest as the newest producing area in the Middle East and as the first

NEUTRAL ZONE PRODUCTION

Name of field and discovery year—	Proved acres	Depth (ft.)	No. wells— Flow.	Pump.	Production, bbl.— Daily	Cumulative	Gravity, °A.P.I.
Wafra (Shallow Zone), 1954		1,250					17-18
Wafra (Burgan sand), 1953	10,000	3,600	36		45,000	21,562,212	24.0
Wafra (Ratawi Zone), 1955		6,750	1		800	10,000	24.9
Total			37		45,800	21,572,212	

averaged 178,200 bbl. daily the first 10 months of the year.

Up to the time of the crises, Iraq was having its best crude-production year. October, the final month before the pipelines were severed, was the best on record. I.P.C. companies produced 759,200 bbl. daily in this period, compared with the yearly average of 720,300 bbl. daily. Another 5,000 bbl. daily was produced by a British Petroleum Co., Ltd., company on a concession located in Iraq due to a border change made years ago.

I.P.C. pipelines had been an issue to a lesser extent earlier this year. The company was involved in a dispute with Lebanon over royalties. As an upshot, I.P.C. changed its plans for terminating a 24-in. loop at Tripoli. Instead, it decided to build the loop in Syria, terminating at Banias. The new section would increase throughput 180,000 bbl. daily.

IRAQ REFINING

Company—Refinery location—	Bbl. per stream day— Crude dist.	Cracking	Other processing
Gov't. Oil Refineries Administration—			
Baghdad	[1]24,000	9,600 Vis 8,600 TC	TR-2,880, V-10,800, [2]L-500
Iraq Petroleum Co., Ltd.:			
K. 3 (Haditha)	6,450		
Kirkuk	[2]2,880		
Khaniquin Oil Co., Ltd.:			
Khaniquin	10,250		
Muftieh Depot, Basrah	3,250		
Total	46,830	19,200	

(1) Plan is to double this crude capacity, adding a second vacuum unit, a Platformer and 10,000-ton yearly asphalt plant. (2) Plant also has 565,000 bbl. daily crude stabilization unit. (3) Building.

The I.P.C. group in Iraq consists of three affiliated companies. Iraq Petroleum Co., Ltd., has a concession over northeastern Iraq, which includes Kirkuk and nearby Bai Hassan and Jambur fields. Mosul Petroleum Co., Ltd., operates in western Iraq. Its group of fields northwest of Kirkuk have a comparatively level output of about 25,000 bbl. daily. A feeder line carries this production into the main I.P.C. system. Basrah Petroleum has the territory in southern Iraq. It produces Rumaila and Zubair fields.

The companies are owned by the same parent companies in the same proportion of interest. Separate operating companies were formed because the three concessions were granted at different times. Four of the parents have 23¾ per cent interest. They are B.P., Royal Dutch-Shell, Cie. Francaise des Petroles, and Near East Development Corp., owned jointly by Standard Oil Co. (N. J.) and Socony Mobil Oil Co., Inc. The C. S. Gulbenkian estate has the remaining 5 per cent.

Co., Ltd., confirmed another major field this year. The company, which has a concession over the entire shaikhdom, made the find in the northeast part of the country, near the Iraq border. The 2 Raudhatain, an offset 1.8 miles southeast of the discovery, was bottomed this year at 9,695 ft. The 1 Raudhatain was carried to 10,301 ft. in 1955. Later this year, the company was drilling a wildcat, 1 Sabriya, 8 miles further southeast.

There were indications that the ruling shaikh might soon grant offshore concessions. Bids were invited. But there was no promise that the highest offer would be accepted. Because the offshore areas are near some of the world's biggest fields, stiff competition is anticipated. Before concessions could become definite, countries bordering the Persian Gulf would have to fix definite boundaries on underwater areas.

Crude deliveries dropped to 25 per cent of normal following the Suez shutdown. Two tankers per day instead of the normal eight were loading at Mina-al-Ahmadi in November. Liftings were expected to rise to five tankers a day at the end of the year.

KUWAIT REFINING

Company—Refinery location—	Bbl. per stream day— Crude dist.	Cracking	Other processing
Kuwait Oil Co., Ltd.:			
Mina-al-Ahmadi	[1]30,000		A-210[2]
Total	30,000		

(1) 160,000 bbl. daily in crude capacity under construction. (2) Barrels daily.

production in the region to be developed by independent companies.

An extensive field development program was carried on and there were hopes early this year that output might reach 100,000 bbl. daily by the end of 1956. Production the first 6 months averaged 37,200 bbl. daily, compared with the 1955 yearly average of 24,200 bbl. daily. Fifteen wells were completed the first half, all of them as producers. Total footage was 48,960 ft. An estimated 20 development wells totaling 59,650 ft. and 1 wildcat projected to 4,529 ft. were planned for the second half. At midyear, five wells were shut in in the Shallow zone and two more were drilling. One was drilling in the Ratawi zone.

Getty Oil Co. holds the concession for Saudi Arabia's undivided one-half interest in the desert area, while American Independent Oil Co. has Kuwait's share. Neutral Zone crude was marketed in four countries during the year: Italy, France, Japan, U. S.

SAUDI ARABIA

● Saudi Arabia made impressive production gains this year, increasing its output more than any other Middle Eastern country with the exception of Iran.

The four fields on production in the kingdom — Ghawar, Abqaiq, Damman, and Qatif—averaged 1,042,400 bbl. daily the first 10 months, up 9.6 per cent over January - October last year.

When the Suez Canal and the Iraq Petroleum Co., Ltd., pipeline system were destroyed late this year, Trans-Arabian Pipeline Co. (Tapline) shipments remained the only Middle East crude supplies available to Europe on a normal basis. Loadings at Sidon, on the Mediterranean Coast, continued without interruption. But the Saudi Government forbade deliveries to French or United Kingdom ports. As a result of the canal closing, Saudi output was reduced to 75 per cent of normal.

Arabian American Oil Co. has under way a pilot water-flood project at Abqaiq field, the first undertaken in the Middle East. The program was designed to obtain information for use in water-injection programs which might be undertaken

SAUDI ARABIA PRODUCTION

Name of field and discovery year—	Proved acres	Depth (ft.)	No. wells—Flow.	No. wells—Pump.	Production, bbl.—Daily	Production, bbl.—Cumulative	Gravity, °A.P.I.
Abqaiq	88,600	6,800	44	....	293,703	1,177,793,805	38
Abu Hadriya, 1940*	....	10,115	....	....	....	9,579	36
Damman, 1936	11,600	4,850	§29	....	47,872	345,290,335	35
Fadhili, 1949*	1,900	9,850	....	....	....	....	38
Kharsaniya, 1956‡	....	....	....	....	....	....	....
Ghawar, 1948	515,700	7,125	74	....	669,336	896,835,683	35
Qatif, 1945	21,300	7,350	10	....	36,155	77,445,524	35
Safaniya, 1951†	69,300	5,560	....	....	....	58	27
Total			157	....	1,047,066	2,497,374,984	

*One-well field shut in. †17-well field shut in awaiting pipeline. ‡Discovery not fully evaluated. §Includes three gas wells.

SOUTHERN ARABIA

● Several drilling operations were carried on in the territories of Southern Arabia during the year. In Dhofar, where Cities Service Co. and Richfield Oil Co. have a joint operation on a 32,000-sq.-mile concession, 1 Marmul encountered a faint oil show. An earlier test, 1 Dauka, 80 miles west, was abandoned at 11,700 ft. as a dry hole.

An affiliate of Iraq Petroleum Co., Ltd., was drilling a test at Jebel Fahud in the barren interior of Oman. Another I.P.C. affiliate abandoned a well at 12,500 ft. in the Trucial Coast area

ADEN REFINING

Company—Refinery location—	Bbl. per stream day—Crude dist.	Bbl. per stream day—Cracking	Other processing
Aden Petroleum Co., Ltd.:			
Aden	120,000	....	CH-3,500,[1] Pf-12,000
Total	120,000	....	

(1) A 12,000-bbl.-daily reformer planned.

TURKEY

● Exploration got off the ground this year as a dozen companies obtained 141 concessions.

The grants followed passage last year of the amended oil law, opening seven of nine zones in Turkey. Companies obtaining acreage, either directly or through affiliates, were: Standard Oil Co. (N.J.); Royal Dutch-Shell; Tidewater Oil Co., later joined by Seaboard Oil Co. and Atlantic Refining Co.; Feldman Oil & Gas, Inc.; Turkish National Oil Co.; Socony Mobil Oil Co.; Gilliland Oil Corp.;

TURKEY PRODUCTION

Name of field and discovery year—	Proved acres	Depth (ft.)	No. wells—Flow.	No. wells—Pump.	Production, bbl.—Daily	Production, bbl.—Cumulative	Gravity, °A.P.I.
Garzan, 1950	6,795	4,593	....	9	1,000	....	26
Raman, 1946	5,140	4,921	....	12	5,500	3,261,905	20
Total Turkey			....	21	6,500	3,261,905	

later. The big field also has the first large gas-injection plant designed for reservoir pressure maintenance built in the Persian Gulf area. A monthly gas-injection record was set this year when 170,400 M.c.f. daily was recycled.

Aramco, whose 365,000-sq.-mile concession area includes territorial waters and offshore areas, has nearly completed a 140-mile, 22-in. pipeline from Safaniya field, lying for the most part in the Persian Gulf near the Neutral Zone border. The line will carry the field's 27°-gravity sweet crude to Ras Tanura starting early next year. (See article, this issue, page 182.)

A rank wildcat discovery near the coast 80 miles northwest of Dhahran tested at 2,200 bbl. daily from the top 22 ft. of the Arab zone this year. The well, 1 Kharsaniya, encountered pay at 5,954 ft.

Tapline, an Aramco affiliate, has a project under way to increase the capacity of its 753-mile crude line to Sidon, Lebanon, from 325,000 bbl. to 410,000 bbl. daily. The expansion will include the first use of combustion-gas turbines on a major line. The program is scheduled for completion early in 1958. Tapline this year offered to revise its payments to countries traversed by the line, Saudi Arabia, Jordan, Lebanon, and Syria. The company volunteered to convert to a profit-making firm and split profits 50-50 with the four countries. It is now operating on a cost basis. The companies are considering the offer, under which they would receive a total of about $16,000,000 a year.

Tapline is owned by shareholders of Aramco in the same proportion of interest. Standard Oil Co. of California, The Texas Co., and Standard Oil Co. (N. J.) each hold 30 per cent. Socony Mobil Oil Co., Inc., holds 10 per cent.

The dispute remains unsettled between Saudi Arabia and Britain over undefined boundaries separating the kingdom and small British-protected shaikdoms in southern Arabia. Efforts to settle the problem by an international tribunal broke down late in 1955 when the British arbitrator walked out. Feelings ran high early this year. But the problem toward the end of the year was on the shelf.

A decision is expected within a few months on another dispute, this one involving Aramco and Saudi Arabia over preferential shipping rights granted by the government to A. S. Onassis in 1954. The arrangement would give Onassis virtual control of crude exports if it goes into effect. Several maritime nations protested the deal. A three-man tribunal was to receive final memoranda from the disputants in November.

SAUDI ARABIA REFINING

Company—Refinery location—	Bbl. per stream day: Crude dist.	Cracking	Other processing
Arabian American Oil Co.:			
Ras Tanura*	189,000		TR-26,000, Poly-1,000, A-900, FH-14,000[1]
Total	189,000		

*Figures on calendar-day basis. (1) A 15,000-bbl. Hydrofiner due on stream June 1957.

claimed by both Abu Dhabi and Saudi Arabia. A company jointly owned by British Petroleum Co., Ltd., and Cie. Francaise des Petroles made plans for an offshore test in 50 ft. of water 20 miles from Das, an island in the Persian Gulf 60 miles off Abu Dhabi.

C. Deilmann Bergbau GmbH., a West German firm holding an exploration contract with Yemen, advanced work to the stage where a wildcat location was staked. But the firm said it would stop work and introduce arbitration proceedings after the government granted a concession late in 1955 to Yemen Development Corp. over northeastern Yemen. Deilmann said it had an option on the territory. Yemen became involved in another dispute when it protested a concession over Kamaran Islands in the Red Sea granted to B.P. by Aden.

Plans were made to add a 8,000-bbl.-daily thermal reformer at Aden refinery, the first special process unit to be built since operations began in 1954. Bunker fuel output, which averaged 42,000 bbl. daily last year, is the backbone of the refinery operation.

Bolsa Chica Oil Co.; Istanbul Natural Gas Co.; Husky Oil Corp.; C. Deilmann Montan G.m.b.H.; and Caltex.

Drilling got under way in fall when Gilliland Oil started a directional well on Iskenderun Bay on the Mediterranean Sea. Caltex's affiliate, American Overseas Petroleum, Ltd., plans a test near Gaziantep in southern Turkey.

Two refinery projects are proposed, Turkish American Oil Co., a newly organized independent firm, received approval for a 15,000-bbl.-daily refinery at Istanbul. A group of majors, California Texas Co., British Petroleum Co., Ltd., Socony Mobil, and Shell made a counterproposal for a 60,000-bbl.-daily plant in the country. This offer is still under discussion.

Construction contracts were let for two military products pipelines being built for Turkey under N.A.T.O. sponsorship.

TURKEY REFINING

Company—Refinery location—	Bbl. per stream day: Crude dist.	Cracking	Other processing
Turkish American Oil Co.—Istanbul	(1)	(1)	(1)
Turkiye Petrolleri A. O.—Batman	7,360	3,000 TCC	V-1,850, A-1,600
Total	7,360	3,000	

(1) New refinery due for construction 1957 to include 16,600-bbl. crude unit, 6,400-bbl. vacuum unit, 2,400-bbl. visbreaker, 4,900-bbl. fluid cat cracker, and 480-bbl. cat poly unit.

EUROPE . . .

AUSTRIA

● The Austrian oil industry, regained by the country from the Russians in August 1955, was a major issue in the national elections held this year. The outcome was generally regarded as favoring private companies since the conservative party came out somewhat stronger in the coalition government. This party had favored 51 per cent state ownership of the industry and cooperation with private companies. Socialists had campaigned for 100 per cent nationalization.

Shipments of crude-oil reparations

AUSTRIA PRODUCTION

Name of field and discovery year—	Proved acres	Depth (ft.)	No. wells— Flow.	Pump.	Production, bbl.— Daily	Cumulative	Gravity, °A.P.I.
Aderklaa			*2	*33	1,806		39-46.5
Gosting					676		
Matzen-Auesthal		5,200-7,500	*160	*320	50,719		23-41
Muehlberg					5,062		
Neusiedl A. Zaya, 1939		2,900			2,714		22-29
Puchkirchen, 1956		7,750	1		107		34
Zistersdorf-Gaiselberg					2,104		
Total					63,188		

*Estimated.

FRANCE

●Oil companies in France continued to go over likely prospective areas with a fine-toothed comb this year. But results did not come close to matching the 1954 discovery of Parentis field, which accounted for 82 per cent of France's 25,557-bbl.-daily total output in July.

Thirty-seven wildcats were drilled in France the first half of 1956 with a total footage of 194,762 ft. There was one discovery, Eschau field found by Ste. de Prospections et Exploitations Petrolieres en Alsace. It is on pump with an output of 22 bbl. daily. Of 11 development wells drilled to a total of 81,569 ft. the first half, there were seven oil and two gas producers, and two dry holes. During the second half, 31 more wildcat and 20 more development wells were planned.

Half the acreage in Parentis concession, located in southwest France, was given up this year under French law. A 5-year extension was obtained on the remaining area, nearly 2,200,000 acres in three sections. Esso-Rep became title holder of the concession, replacing Esso Standard S.A.F., which holds 89 per cent interest in the new company. Esso Standard is owned 63.2 per cent by Standard Oil Co. (N.J.).

Parentis output in July of 20,828 bbl. daily was up 73.5 per cent over the same period last year. Two tests in other parts of the concession came in as producers later this year. The 1 Lugos, 13½ miles northeast of Parentis, was put on pump at 400 bbl. daily in August. A half-mile offset was started a short time later. The 1 Lucats, 4½ miles southeast of 1 Parentis, was tested at 30 bbl. daily on a drill-stem test in October. Mothes field, discovered 9 miles east of Parentis last year, was on pump as a one-well field. Four offsets were dry.

Ste. Nationale des Petroles d'Acquitaine further developed field facilities

FRANCE PRODUCTION

Name of field and discovery year—	Proved acres	Depth (ft.)	No. wells— Flow.	Pump.	Production, bbl.— Daily	Cumulative	Gravity, °A.P.I.
Donau-Soufflenheim, 1954	400	1,650	1	9	191	72,084	30.2
Eschau, 1956		2,940		1	22	653	33.9
Gallician, 1951		6,600	2		7	24,690	25.7
Lacq, 1949	1,457	2,200	15	17	3,301	10,596,600	21.8
Mothes, 1955		8,150	1		319	135,393	21.0
Parentis, 1954	7,560	7,700	14	2	20,828	8,448,300	32.7
Pechelbronn, 1813		600-4,000	4	340	682	22,426,173	27.5
Reininque, 1955		4,720	2		128	28,658	39.8
Schirrhein, 1954	750	1,780		2	16	21,577	28.7
Staffelfeldon, 1952	400	6,270	1	2	63	367,479	40.4
Total France			40	373	25,557	42,121,607	

to Russia, which will amount to 70,000,000 bbl. over 10 years, went smoothly until the Hungarian revolt. Exports then dropped sharply. Crude output the first 7 months was 64,300 bbl. daily, compared with the 1955 yearly average of 68,200 bbl. daily.

Matzen-Auersthal, northeast of Vienna, is the main field. It accounts for about 80 per cent of total production and has about 92 per cent of the country's proved reserves. Other fields in eastern Austria are in a state of decline.

Most production is handled by the government in areas which were held under concession by private companies in prewar days. But three companies still have minor output: Socony Mobil Oil Co., Inc., and Royal Dutch-Shell through Rohoelgewinnungs, A.G., and Col. R. K. Van Sickle, a Canadian operator.

R.A.G. opened a new oil province this year when it brought in a discovery in the Alpine foothills of western Austria, across the country from other production. The well, 1 Puchkirchen, is producing better than 100 bbl. daily.

AUSTRIA REFINING*

Company—Refinery location—	Bbl. per stream day: Crude dist.	Cracking	Other processing
A.G. der Shell Floridsdorfer Mineralolfabrik—Floridsdorf	3,400		L-1,020
Benzin-Bensolverband—Voesendorf	2,500		L-800
Deutsche Gasolin—Korneuburg	6,600		
Don au Oel G.m.b.h.—Moosbierbaum	6,600	5,900 TC	
Oesterreichische Mineraloelwerke—Lobau	8,600		
Nova Mineraloel Raff. A.G.—Schwechat	13,200	5,580 TC	L-820
Vacuum Oil—Kagran	4,300		L-160
Total	45,200	11,480	

*Figures based on calendar-day basis.

at Lacq natural gas field, which underlies a small oil field in Acquitaine basin of southern France. The field is expected to produce 23,000 M.c.f. daily in 1957, and 71,000 M.c.f. daily by 1960.

Several exploration concessions were either granted or applied for in the Paris and Alsace basins. British Petroleum Co., Ltd., entered French exploration for the first time through interest in Ste. des Petroles de Valence, which obtained licenses on the western edge of the French Alps.

National law requires heavy French participation in exploration. The government, as well as private investors, has interests in both domestic and foreign programs. Cie. Francaise des Petroles, in which the government has 40 per cent interest, has a 23¾ per cent share in Iraq Petroleum Co., Ltd., and affiliated companies, and a 6 per cent interest in the Iranian consortium.

Several companies, including Royal Dutch-Shell, have under consideration a trans-Europe pipeline project. The 700-mile crude line would originate at Marseille and terminate at Rotterdam. It would reduce tanker hauls from the Middle East, and permit construction of refineries near centers of consumption, rather than at seaports. If the plan materializes, it would cost up to $280,000,000.

France's policy of home refining dates back to before World War II, and several expansion projects were under way this year. Esso-Standard S.A.F. plans to build a 30,000 to 40,000-bbl. daily refinery near Bordeaux. It will be ready in 3 years.

FRANCE REFINING

Company—Refinery location—	Bbl. per stream day: Crude dist.	Cracking	Other processing
Cie Francaise de Raffinage:			
Gonfreville	79,200	19,000 FCC 10,000 Vis	TR-12,700
La Mede	118,000	11,800 FCC 2,000 TC	TR-18,500
Cie. Raffinage Shell-Berne:			
Berre L'Etang*	75,000	10,000 FCC	TR-9,000
Pauillac*	12,000		
Petit Couronne*	50,000	11,000 FCC 5,000 TC	TR-3,500
Esso Standard, S.A.:			
Port Jerome	93,500	11,000 FCC	TR-14,000
Pechelbronn, S.A.:			
Merkwiller	4,600		
Raffineries Francaise des Petroles:			
Donges	37,400	10,500 FCC	TR-4,900
Caltex, S.A.F.:			
Gironde*	16,500	(1)	TR-3,600,[2] V-6,600,[3] P-400
Ste. Francaise des Petroles B.P.:			
Dunkirk	48,000		V-9,000, TR-6,800, L-1,700, A-2,000
Lavera	[4]54,000		TR-5,000, Pf-6,000
Mobil Oil Francaise:			
Gravenchon	18,900		TR-2,500,[5] Sov-4,100, V-6,200, L-1,700[6]
Frontignan	29,000	18,000 FCC	TR-2,500
Total	636,100	108,300	

*Figures on calendar-day basis. (1) A 4,700-bbl. daily fluid cat cracker to go on stream in 1957. (2) On stream in 1957. (3) On stream in 1957). (4) A 50,000-bbl. crude unit to be added. (5) Idle. (6) A 1,100-bbl. lube plant and 5,500-bbl. catalytic hydrogenation unit planned.

ITALY

ITALY PRODUCTION

Name of field and discovery year—	Proved acres	Depth (ft.)	No. wells— Flow.	Pump.	Production, bbl.— Daily	Cumulative	Gravity, °A.P.I.
Cortemaggiore, 1949		6,230	....	....	.....	.....	35
Ripi		.....	....	....	.....	.....	..
S. Giorgio		.....	....	....	.....	.....	..
Tramutola		.....	....	....	.....	.....	..
Ragusa (Sicily), 1953		6,000	9	....	9,100	2,763,100	12-16
otal			11	....	*11,500	7,187,100	

*Production on the Italian mainland is still controlled by Azienda Generale Petroli Italiana, the government company which does not reveal individual field production.

ITALIAN REFINING

Company—Refinery location—	Bbl. per stream day— Crude dist.	Cracking	Other processing
A.G.I.P. Minearia S.P.A.—Cortemaggiorie	2,800	2,800 FCC	.....
Anonima Petroli Italiani—Falconara	26,000	8,000 TC	.....
Aquila Societa Technico-Industriale—Frieste	26,000	3,000 FCC	.....
Condor, S.P.A. per l'Industria Petrolifera e Chimica—Rho	45,000	15,000 FCC	.....
Delle Paine—Genoa	1,000	.....	.....
Distilleria Italiana Catrami—Carrara	3,000	500 TC	.....
Esso Standard Italiana—Trieste	6,500	1,000 TC	CR-1,000, L-1,600, A-1,900
Galetti—Florence	3,700	900 TC	.....
Garrone—Genoa	25,800	.....	CR-4,500, L-300, A-450
Industria Raffinazione Oil Minerali, "I Rom" S.P.A.—Venice	35,000	.....	V-7,000, TR-7,600, Pf-2,000, Poly-1,400
Industri Chimiche Italian del Petroleo—Mantova	12,000	4,000 TC	Pf-2,000
I.L.S.E.A.—Como	2,700	300 TC	CR-600
I.P.L.O.M.—Genoa	1,200	.....	.....
Lombarda Petroli—Milan	5,800	.....	.....
Purfina Italiana, S.P.A.: Florence	3,500	.....	.....

• The future of exploration and production on the Italian mainland remained clouded this year, with a proposed new oil law still not final.

After months of debate, the law was passed by Parliament. It has been submitted to the Senate. The bill is a comparatively tough one, providing for a sliding scale of royalties on major discoveries. There also would be a 7,413-acre limit around a discovery, with the government monopoly, Ente Nazionale Idrocarburi (E.N.I.), having an option on remaining acreage. An earlier draft called for a 60-40 profit split, favoring the government. This was discarded.

If the proposed legislation is passed as it now stands, there is doubt as to how far foreign companies will be willing to invest. Gulf Oil Corp., which has more at stake than any

SPAIN

• Spain's two major refineries both had expansion programs under way this year. Cia. Espanola de Petroleos, S.A., (C.E.P.S.A.) put a new 35,000-bbl.-daily crude-distillation unit on stream bringing the total capacity of its refinery at Santa Cruz de Tenerife, Canary Islands, to 65,000 bbl. daily. The fact that a unit of this size was built without additional process facilities reflected the growing demand for heavy fuels in the European area.

Refineria de Petroleos de Escombreras, S.A., is adding a 15,000-bbl.-daily topping unit plus a 10,000 bbl. daily Platformer at its 45,000-bbl.-daily refinery at Cartagena. Owners of the company are the government's Institute Nacional de Industria, 52 per cent; Caltex, 24 per cent; and C.E.P.S.A., 24 per cent.

At least three exploration programs were carried on this year. The most extensive work was done by Cia. de Investigacion y Explotaciones Petroliferas, S.A., a subsidiary of C.E.P.-S.A., and its affiliate, C. Deilmann Bergbau. The partners had three rigs operating this year. Early in 1956, a natural-gas discovery was made in Navarre Province at Zuniga.

An American group, represented by DeGolyer & MacNaughton, has an interest in Spanish exploration through partnership with I.N.I. in Valdebro. Last year, the company carried on drilling operations in Central Spain, and did surface work over

ITALIAN REFINING (Continued)

Company—Refinery location—	Bbl. per stream day— Crude dist.	Cracking	Other processing
Genoa	11,000	1,500 FCC	A-1,100, CR-800
Milan	7,500		V-3,000, L-350, CR-500, A-1,000
Rome	11,000	1,500 FCC	CR-500, A-1,250
Petroli d'Italia—Piacenza	4,000	1,000 TC	
Raffinerie Sicilane Oli Minerali—Augusta, Sicily	55,000	10,000 FCC 8,200 TC	CR-1,000, A-1,500, Poly-1,000
Raffineria Oli Lubricanti—Viguzzolo	1,400		
San Quirico—Genoa	3,000		
S.A.R.O.M.—Ravenna	[1]30,000	5,000 TC	
S.I.R.O.M.—Milan	1,500		
Sta. per Azioni Raffinera Padana Olii Minerali—Novara*	13,300	2,880 FCC	V-5,150, TR-3,150, Poly-315
Sta. per l'Industria Italiana—Farnovo Taro	3,200		
Mobil Oil Italiana—Naples	[2]77,500	22,000 FCC	[3]L-365, A-300, Poly-1,000
Stanic Industria Petrolifera—Bari	[4]44,500		TR-4,000, [5]A-480
Leghorn	45,000	3,700 FCC	[6]A-6,200
S.T.O.I.—Firenze	3,500		(7)
Raffineria Volpato—Milan	3,000		
Sta. per l'Industria del Petrolio—La Spezia*	30,000		TR-3,000, CR-6,700
Asfalti Bitumi-Catramie Derivati—Ragusa, Sicily	100		
Bianchi Petroli—Cologno Monzese	1,500		
Total	546,000	91,280	

*All figures on calendar-day basis.

(1) A 50,000-bbl. daily vacuum unit, 4,000-bbl. cat reformer, 2,000-bbl. thermal reformer under construction. (2) Includes 5,500 bbl. daily fed directly to cat cracker. (3) A 250-bbl. daily lube-oil unit being added. (4) A 4,900-bbl. crude unit planned, plus 7,300-bbl. Powerformer and 8,240-bbl. Hydrofiner. (5) Tons daily. (6) A 9,000-bbl. cat reformer and 3,600-bbl. thermal reformer under construction. (7) A 11,000-bbl. crude unit, 1,200 bbl. cat reformer, and 600-bbl. thermal reformer under construction.

other company, warned that it will pull out of Italy unless the law is liberalized. A Gulf subsidiary has two shut-in discoveries near the Adriatic, across from Rome. A development concession has never been obtained.

There were indications, however, that the country still would hold interest for outside companies. Cities Service was listed among a dozen companies slated to get exploration permits if the law is passed. In another venture, two American independents, Jack H. Heathman, Wichita, and A. A. Seeligson, Jr., San Antonio, made a joint exploration and production arrangement with a large Italian industrial company.

Sicily, where there is a separate oil law, currently is the brightest spot in the Italian exploration picture. Ragusa field, in the southeast part of the island, has turned out to be one of the best in Europe. There were 14 producing wells late this year and reserves were rated at 22,600,000 tons, or about 147,000,000 bbl. The field is operated by Gulf Italia Co., a wholly owned Gulf subsidiary. A Standard Oil Co. (N. J.) subsidiary has made two small natural-gas discoveries in northeastern Sicily, and a British Petroleum Co., Ltd., subsidiary has found noncommercial shows on its acreage.

The natural-gas industry in the Po Valley expanded this year. Pipeline construction is continuing and output surpassed the 330,000 M.c.f. daily level of 1955. AGIP Mineraria, a part of E.N.I., accounted for around 94 per cent of the output.

Italy's refining capacity far exceeds domestic needs. Despite rising local consumption, refinery runs were off slightly early in the year due to stiff export competition.

SPAIN REFINING

Company—Refinery location—	Bbl. per stream day— Crude dist.	Cracking	Other processing
Cia. Arrendataria del Monopolio de Petroleos: Hospitalet	700		
Cia. Espanola de Petroleos, S.A.: Santa Cruz de Tenerife, Canary Islands	65,000	3,500 TC	V-2,500, Pf-5,000, L-600, A-200[2]
Refineria de Petroleos de Escombreras, S.A.: Escombreras*	[3]45,000		V-2,300, TR-9,000, Poly-1,600, L-530
Total	110,700	3,500	

*All figures on calendar-day basis. (2) Tons daily. (3) A 15,000-bbl. crude unit planned, plus a 10,000-bbl. Platformer.

prospective areas throughout the country.

Empresa Adaro, a subsidiary of I.N.I., found natural-gas shows in shallow wells in Guadalquivir Valley in southern Spain. The company is carrying on further exploration under a contract with a subsidiary of the Italian Government's Ente Nazionale Idrocarburi.

A 485-mile military products pipeline was expected to be completed this year after delays by bad weather. The 12, 10, and 8-in. line runs diagonally across Spain from Rota on the Atlantic Coast to Zaragoza, northeast of Madrid. The line will feed United States air bases.

UNITED KINGDOM

UNITED KINGDOM PRODUCTION

Name of field and discovery year—	Proved acres	Depth (ft.)	No. wells— Flow.	Pump.	Production, bbl.— Daily	Cumulative	Gravity, °A.P.I.
Caunton, 1943	60	2,000-2,200		10	30	220,000	28.0
Duke's Wood, 1941	400	1,800-2,500		108	641	3,203,000	33.0
Eakring, 1939	200	1,800-2,500		45	144	1,846,000	33.0
Egmanton, 1955	1,050	3,100-3,400		7	159	37,000	39.0
Formby, 1939	20	85-130		10	2	70,000	34.5
Kelham Hills, 1941	350	2,000-2,500		44	272	1,585,000	28.0
Plungar, 1953	250	2,800-2,900		5	95	45,000	31.0
Total				229	1,343	7,006,000	

UNITED KINGDOM REFINING
England

Company—Refinery location—	Bbl. per stream day— Crude dist.	Cracking	Other processing
Manchester Oil Refg., Ltd.—Manchester	4,000		V-2,500, L-2,000
Berry Wiggins & Co., Ltd.:			
Rochester	4,300		
Weaste	[1]1,850		
Esso Petroleum Co., Ltd.—Fawley	[2]150,000		
Kent Oil Refinery, Ltd.—Isle of Grain	[3]100,000	12,500 FCC	V-34,000, Pf-6,000, L-2,750
Lobitos Oilfields, Ltd.—Ellesmere Port	4,000	1,000 TC	
Shell Refg. & M'kting Co., Ltd.:			
Heysham*	36,000	6,000 Vis	TR-4,000
Androssan*	3,200		
Shell Haven*	[4]75,000	33,000 FCC	TR-10,000, CR-6,700
Stanlow*	100,000	33,000 FCC	TR-10,000, CR-9,000
Mobil Oil Co., Ltd.—Coryton	[5]31,000	12,000 TCC	V-14,400, [6]L-2,600
England total	509,300	64,500	

*Figures on calendar-day basis.

(1) A 1,500-bbl. crude unit under construction. (2) 50,000-bbl. daily crude capacity being added. Due on stream in 1958. (3) Expansion program includes additional 80,000-bbl. daily crude unit, 12,000-bbl. daily visbreaker, 10,000-bbl. Platformer, 20,000-bbl. cat hydrogenation unit, and alkylation unit with 2,250-bbl. daily output. (4) New 80,000-bbl. per calendar day crude unit due on stream in mid-1958. (5) New 8,000-bbl. per calendar day crude unit being added. (6) New 6,000-bbl. Sovaformer being added.

BELGIUM

• Refinery expansion in Belgium this year was limited to the addition of special process units. Soc. Industrielle de Petroles had the biggest project under way, with a 10,000-bbl.-daily Platformer, and a 10,000-bbl.-daily catalytic hydrogenation unit scheduled to go on stream in 1958 at its 65,000-bbl.-daily plant near Antwerp. The company is jointly owned by Cie. Financiere Belge des Petroles, S.A. (Petrofina), and British Petroleum Co., Ltd.

Belgium is the home country of Petrofina, a holding company with controlling interests in tanker, refining, producing, and marketing companies. The firm expanded further this year, entering the United States by acquiring Panhandle Oil Corp. through the newly formed American Petrofina.

BELGIUM REFINING

Company—Refinery location—	Bbl. per stream day— Crude dist.	Cracking	Other processing
Albatros S.A. Belge pour le Raffinage de Petrole—Antwerp	14,000	4,500 HD	V-6,000, Poly-700
Belgian Shell Co., S.A.—Ghent	3,000		
Cie. Industrielle "Atlas," S.A.—Antwerp	2,500		
Esso Standard Refinery, S.A.—Antwerp	36,500	10,500 FCC	[1]TR-4,200
Raffinerie Belge de Petroles, S.A.—Antwerp*	13,400		V-4,000, [2]TR-2,250
Raffineries et Distilleries Anversoises—Anvers-Kiel	3,800		TR-900
Ste. Industrielle Belge des Petroles—Wilmarsdonk	65,000	10,000 FCC	V-19,000, [3]Poly-3,000
Total	138,000	25,000	

*Figures on calendar-day basis.

(1) 5,600-bbl. cat reformer and 6,900-bbl. catalytic hydrogenation unit planned. (2) 2,190-bbl. cat reformer under construction. (3) 10,000-bbl. Platformer and 10,000-bbl. cat hydrogenation unit on stream in 1958.

UNITED KINGDOM REFINING (Continued)

Scotland

Company—Refinery location—	Bbl. per stream day: Crude dist.	Cracking	Other processing
Grangemouth Pet. Refg., Ltd.—Grangemouth	49,000	12,500 FCC	V-17,000, CH-500, Poly-2,200
Scottish Oils, Ltd.—Pumpherston*	3,500	1,500 TC 1,300 CK	
Scotland total	52,500	15,300	

*Feed stock includes crude and shale oil.

Wales

National Oil Refineries, Ltd.—Llandarcy	70,000	12,500 FCC	V-25,000, Pf-6,000, CH-3,500, L-2,000, A-500
Esso Petroleum Co., Ltd.—Milford Haven	(1)		
Wales total	70,000	12,500	
United Kingdom total	631,850	92,300	

(1) 100,000-bbl. daily refinery planned.

● The United Kingdom continued in its role as one of the major centers of the oil industry this year. Royal Dutch-Shell, in which British interests own 40 per cent, and British Petroleum Co., Ltd., handled about one-third of the free world's oil business. U.K. is the second largest free-world consumer, behind the U. S. It also has second largest refining industry.

Several major expansion programs, including both crude-distillation and special processing capacity, were either under way or planned this year. Among the bigger projects, British Petroleum is adding an 80,000-bbl. crude unit at its Kent refinery on the Isle of Grain, and Shell is adding a unit of the same size at Shell Haven. Esso Petroleum Co., Ltd., will build a 100,000-bbl.-daily plant at Milford Haven, a Welsh port. It will cost about $56,000,000.

Milford Haven came into prominence this fall when a shutdown of Suez Canal first threatened. It is a natural harbor, and is perhaps the only port in Europe that could handle giant tankers, up to 100,000 tons, without extensive preliminary work. Milford Docks Co. came out with a plan that would make the harbor the leading supertanker terminal and repair center in Europe. This project would require joint participation by companies. About the same time, B.P. came out with a plan for a terminal of its own plus a 60-mile, 100,000-bbl.-daily pipeline that would feed Llandarcy refinery. Esso's project also includes berthing facilities.

Small domestic production is about the same level as in past years. The one wildcat drilled during the first half was a dry hole. But 10 more were drilled by the end of the year. Of 12 development wells, 4 were producers. Twelve more were drilled during the second half. Four rigs are in continuous operation. Future prospects are limited, but seem excellent for finding small productive structures in the East Midlands, similar to present producing fields.

NETHERLANDS

● Further expansion was under way in the Netherlands refining industry this year.

Royal Dutch-Shell is adding 24,200 bbl. daily in catalytic hydrogenation, and 12,700 bbl. daily in catalytic reforming at its 220,000-bbl.-daily Pernis refinery, the largest in Europe. Caltex is expanding its special process facilities at its 41,000-bbl.-daily plant at Pernis by adding 7,000 bbl. daily in Platforming, and 11,000 bbl. daily in catalytic hydrogenation. Both companies expect to have the new units on stream in 1957.

Esso Nederland N.V., a Standard Oil Co. (N.J.) subsidiary, plans to have the country's third refinery on stream early in 1960. Initial capacity of the new plant will be 30,000 to 40,000 bbl. daily. It will be built at Rotterdam.

The joint exploration and production company owned by Shell and Jersey Standard, Nederlandse Aardolie Mij., made further progress in developing crude output. A new field discovery at Wassenaar was on production at midyear with a flow of 663 bbl. daily from 4,100 ft.

NETHERLANDS PRODUCTION

Name of field and discovery year—	Proved acres	Depth (ft.)	No. wells: Flow.	Pump.	Production, bbl.: Daily	Cumulative	Gravity, °A.P.I.
Andel, 1953		3,900-4,700				5,949	20.2
Berkel, 1954		3,600		2	81	44,605	31.9
Delft, 1954		3,800		3	43	57,005	31.8
Rijswijk, 1953		5,100	6	2	960	545,030	31.9
Schoonebeck, 1943		2,500		264	18,820	45,573,128	25.1
Pijnacker, 1955		5,800	1		550	176,662	35.8
De Lier, 1955		5,300	1		173	37,116	35.2
Wassenaar, 1956		4,100	1		663	65,231	19.9
Total			9	271	21,290	46,504,726	

NETHERLANDS REFINING

Company—Refinery location—	Bbl. per stream day: Crude dist.	Cracking	Other processing
N.V. de Bataafsche, Petroleum Mij.—Pernis*	220,000	66,000 FCC 20,000 TC	TR-10,000, [1]CR-12,700 [1]CH-24,200
Caltex Pet. Maatschappij (Nederland) N.V.—Pernis*	41,000	9,000 TC	TR-6,500, P-950, [2]Pf-7,000, CH-11,000
Total	261,000	95,000	

*All figures on calendar-day basis.
(1) On stream second quarter, 1957. (2) On stream in 1957.

WEST GERMANY

• West Germany replaced Austria this year as the leading oil producer in Western Europe.

The ranking spot was gained through intensive development drilling and continued discoveries of small fields, rather than by a few outstanding finds. Output passed 70,000 bbl. daily in September. This level came within a month of doubling the country's production in exactly 4 years.

Crude reserves have increased at a low rate in comparison with gains in production. But there is hope among some geologists in the country that deep drilling could change this picture. There have been few tests as deep as 12,500 ft. and the deepest field lies at 8,600 ft.

Another leading development in the industry this year was a decision to build a 210-mile, 400,000-bbl.-daily crude line from Wilhelmshaven to the Rhur. Six West German refiners, headed by British Petroleum Co., Ltd., and Standard Oil Co. (N. J.) companies, will build the line at a cost of $46,200,000. Wilhelmshaven was selected after months of competing with Rotterdam, which also wanted to have the North Sea terminal. The line is expected to start operations early in 1959 with a throughput of 180,000 bbl. daily.

Among the new refinery projects, Esso A.G. is building a 68,000-bbl.-daily plant at Cologne. An affiliate of Cie. Financiere Belge des Petroles, S.A. (Petrofina), expects to build a 20,000-bbl.-daily plant within 2 years. A location had not yet been picked late this year. Petrofina entered the refining and marketing picture in the country last year. It reopened the 6,500-bbl. Cologne plant of Rhurbau, in which it has 75 per cent interest, this spring.

GERMANY PRODUCTION

Bavaria

Name of field and discovery year—	Proved acres	Depth (ft.)	No. wells— Flow.	Pump.	Production, bbl.— Daily	Cumulative	Gravity, °A.P.I.
Ampfing, 1954		5,900			220	93,626	20.0
Heimertingen, 1954		5,100			180	35,000	33-37.0
Isen, 1954		6,500				2,989	
Total					400	131,515	

Emsland District

Adorf, 1946		4,000-4,400			3	48,834	30.0
Emlichheim, 1944		2,400-2,900			3,000	8,635,434	25.0
Georgesdorf, 1944		1,600-3,300			5,349	11,349,264	24-29
Hebelermeer, 1955					18		
Lingen, 1942		2,300-2,900			2,351	6,913,120	30-32
Ruhlermoor, 1949		2,000-2,800			7,273	9,184,523	25.0
Ruhlertwist, 1949		2,300-2,950			2,896	5,008,735	25.0
Scheerhorn, 1949		2,500-3,700			2,312	3,115,868	30.0
Total					23,202	44,255,778	

Holstein-Hamburg-Schleswig District

Boostedt, 1952		5,500-6,300			2,454	2,036,359	29-31
Bramstedt, 1954		6,200-6,530			1,538	582,158	34-35
Heide, 1935		2,600-5,900			1,577	12,408,022	21-32
Kiel, 1955		5,800			186	50,489	32.0
Ploen, 1952		6,500			1,322	1,148,675	34.0
Reitbrook, 1939		1,400-2,600			1,076	10,924,929	21-22
Schwedeneck, 1956					19		
Total					8,172	27,150,632	

Hanover District

Broistedt, 1937		2,400-3,200			65	421,935	35.0
Calberlah, 1945		160-400			8	53,323	26-34
Eddesse-Olheim, 1876		2,900-3,300			905	2,967,101	32.0
Eddesse-Nord, 1950		500-1,170					26-34
Ehra, 1939		400-820				85,399	16.0
Eicklingen-Wienhausen, 1937		1,600-3,100			215	2,241,363	32-33
Eilte, 1947		3,500-3,700			1	14,111	23.0
Eilte-West, 1955					78		
Eldingen, 1949		4,900-5,300			1,869	3,535,891	35.0
Fuhrberg-Hambuehren, 1939		2,600-2,700			714	5,142,602	22-23
Gifhorn, 1935		650-1,000			27	378,545	16.0
Hademstorf, 1941		4,100-4,500			105	765,345	25-29
Hankensbuttel, 1954		5,000-5,300			4,394	2,219,059	33.0
Hohenassel, 1943		1,400-2,100			345	2,093,445	31.0
Hohne, 1951		4,400-6,500			3,648	4,924,459	33-34
Kronsberg-Pattensen, 1953		2,000			481	187,721	27.0
Lehrte, 1952		3,600-4,000			388	445,194	31.0
Leiferde					61		
Luben					274		
Meckelfeld, 1938		1,000-8,600			39	438,569	24-32
Meerdorf, 1954		5,570				2,776	42.0
Molme		1,600-1,800			36	1,101,099	32.0
Nienhagen, 1899		600-5,350				34,092,872	22-32
Nienhagen-Hanigsen, 1940		2,200-2,770			1,800	4,295,489	24-28
Oberg, 1918		500-1,900			142	2,646,177	34-46
Orrel-Sud, 1954		4,400-4,560			390	206,066	
Rautheim					6		
Ruehme, 1954		2,200-2,300			599	254,395	
Steimbke, 1936		790-3,700			1,027	7,061,634	18.0
Suderbruch, 1949		3,800-7,650			3,286	6,087,901	25-37
Thoeren, 1941		1,500-4,100			284	1,845,109	19-38
Vechelde, 1954		6,000			2	14,833	31.0
Vorhop, 1952		3,200-5,200			660	403,543	36.0
Wathlingen, 1950		2,000			165	386,897	27.0
Wesendorf, 1943		1,200-6,300			1,339	5,799,170	17-42
Wesendorf-Nord					173		
Wietze, 1897		300-1,000			496	18,116,163	16-29
Total					24,022	108,228,186	

Upper Rhine Valley

Dudenhofen, 1955		6,500			8		
Forst-Weiher, 1934		1,200-2,600			33	649,787	32-34
Landau, 1955		4,800			356	127,750	36.0
Rot, 1953		2,100-2,500			134	251,825	25-26
Stockstadt, 1952		1,600			1,225	1,179,146	39.0
Wattenheim, 1954		7,500			14	19,519	
Weingarten, 1936		800-3,600			59	428,503	32-36
Total					1,829	2,656,530	

Deutsche Shell A.G.'s 19,500-bbl. Hamburg-Marburg refinery is getting a $60,000,000 face lifting which will nearly triple capacity. The program, which is expected to last into 1958, will bring throughput at the plant to 56,000 bbl. daily.

Two other phases of the expansion saw the refinery get a 2,300-bbl. daily catalytic reformer, which went on stream around the middle of this year, and an 8,000-bbl.-daily gas desulfurizer, which has just gone into operation.

New reserves . . . On the production front, West Germany is continuing to build up its reserves with unsensational but encouraging strikes in widely separated parts of the country.

In the past 5 months, at least seven tests have come in as producers. Four of them were reported in August. One was a wildcat, in northwest West Germany, which is capable of producing about 75 bbl. daily on pump. An offset to the discovery well in Elsfleth field in the Weser-Ems region tested 95 bbl. daily and two Bavarian wells extended Heimertingen field. These also tested 95 bbl. daily. Two more stepouts are staked for Heimertingen.

An apparent commercial reservoir was tapped in September near the Baltic Coast to push West Germany's producing limit to its northernmost point. The discovery yielded 63 bbl. daily of good crude during production tests from about 5,000 ft. The well, which went on pump, is about 30 miles southeast of the Danish border and 11 miles east of Eckernfoerde. It was shut in and an offset was started 1,000 ft. to the southeast.

The well is located on the western flank of a big Jurassic syncline. To the south, on the same structure, are Kiel, Ploen, and Boostedt fields, which have combined production of about 3,500 bbl. daily.

Two other wildcats came in last month, one of them in the Upper Rhine, 15 miles north of Karlsruhe, and the other in the northwest part of the country about 2 miles east of Quakenbruck.

The Upper Rhine discovery flowed 31°-gravity crude at the rate of 157 bbl. daily through a 1/5-in. choke. At Quakenbruck, the test flowed 95 bbl. daily of 32°-gravity crude through a ⅛-in. choke.

Meanwhile, a drilling program is under way near the foothills of the Austrian Alps and another is set for the Saar region.

GERMANY PRODUCTION (Continued)
Weser-Ems District

Name of field and discovery year—	Proved acres	Depth (ft.)	No. wells— Flow.	Pump.	Production, bbl.— Daily	Cumulative	Gravity, °A.P.I.
Aldorf, 1952		3,600			2,020	2,042,335	32.0
Barenburg, 1953		2,300-2,550			1,712	928,159	29.0
Bockstedt, 1954		3,900			466	242,000	
Dickel, 1953		4,600				2,421	
Dueste-Wietingsmoor, 1954		2,800			2,594	901,863	
Etzel, 1942		4,700			45	343,133	13.0
Elsfleth					97	"	
Garen, 1953		3,200-4,400			26	5,305	28.0
Hemmelte-West, 1951		3,700-4,500			2,680	2,999,280	32.0
Liener, 1953		2,600-4,500			150	108,425	31.0
Molbergen, 1953		2,400			243	250,933	26.0
Ostenwalde, 1953		4,200-4,960			310	97,211	
Oythe					33		
Quakenbruk, 1950		1,200-1,950			47	271,358	35.0
Vestrup, 1955		6,200			49	14,600	39.0
Voigtei, 1953		1,500-1,700			1,724	966,937	31-34
Total					12,196	9,173,960	
Total West Germany					69,821	191,596,601	

GERMAN REFINING

Company—Refinery location—	Bbl. per stream day— Crude dist.	Cracking	Other processing
Badische Anilin & Soda-Fabrik AG. Ludwigshafen—Oppau	1,000		L-200
BP Benzin und Petroleum G.m.b.h.—Hamburg	[1]33,000		PF-6,000, A-1,500
Deutsche Erdoel-AG:			
Heide	17,000	7,700 FCC	L-1,600
Wietze	1,000		
Deutsche Gasolin AG—Dollberger	[2]2,500		
Deutsche Shell AG:			
Monheim/Reisholz*	4,000		
Harburg/Wilhelmsburg/Grasbrook*	10,000		CR-2,300
Harburg	([3])		
Esso AG:			
Hamburg-Harburg	48,500	11,000 FCC	TR-3,500, L-1,500
Cologne	([4])		
Gelsenberg Benzin AG: Gelsenkirchen	[5]60,000	10,000 FCC	TR-7,100, CH-15,500
Gewerkschaft Deurag-Nerog—Misburg	[6]14,600	10,000 FCC	TR-2,000, L-1,600
Gewerkschaft Erdoel Raffinerie Emsland—Lingen-Holthausen	15,000	18,500 FCC	Hf-2,600, Poly-720
Gewerkschaft Grief Bergbau Mineraloelraffinerie—Dollberger	500	18	
Kraftstoff-Handelsgesellschaft mbH.—Essen-Altenessen	1,700		
Mineraloel und Asphaltwerks AG—Ostermoor on Kiel-Canal	[7]2,600		
Mineraloelwerke Albent Sengewald—Dedenhausen	[8]900		
Mineraloelwerke Peine—Peine	400		
Oelwerke Julius Schindler GmbH.—Hamburg-Neuhof	5,600		L-400, A-200
Mobil Oil AG in Deutschland—Bremen	[9]17,400	8,900 TCC	L-700
Ruhrbau GmbH.—Muelheim	[9]6,500		
Ruhrchemie AG—Oberhausen/Holten	[10]6,000	2,100 FCC	CR-1,800
Ruhroel GmbH.—Bottrop-Welheim	[11]2,500		TR-800
Scholeen-Chemie AG—Gelsenkirchen-Buer	21,500	5,100 FCC	CR-2,100, CH-6,500
Union Rheinische Braunkohlen Kraftstoff AG—Wesseling	28,000	11,000 TC	CR-4,400, Poly-400, [12]CH-7,100
Wintershall AG—Salzbergen	2,100		L-430
Zeller & Gmelin—Eislingen	[2]170		
Total	302,470	84,300	

*Calendar day basis.

(1) A 7,000-bbl. crude unit planned plus 6,500 bbl. cat hydrogenation unit and 600-bbl. asphalt plant. (2) Plant shut down. (3) A 37,000-bbl. refinery under construction. (4) New refinery with initial capacity of 68,000 bbl. daily under construction—plans call for increasing to possible 120,000 bbl. later. (5) A 6,000-bbl. crude unit being added. (6) 2,000 bbl. added crude capacity under construction. (7) Additional crude capacity of 2,400 bbl. daily under construction. (8) 4,400 bbl. daily of capacity fed directly to cat cracker. Additional 15,500 bbl. crude unit being added to give plant net crude capacity of 25,000 bbl. daily. Other new units to include 4,100-bbl. Sovaformer, 5,500-bbl. cat hydrogenation unit and 250-bbl. lube capacity. (9) Plant reopened after Petrofina bought control. Will not be expanded. Instead, Petrofina plans a new 20,000-bbl. refinery in Germany. (10) Additional 3,600 bbl. crude capacity under construction plus 2,000 bbl. thermal cracking unit. (11) Crude capacity being expanded to 5,000 bbl. plus 1,400-bbl. cat reformer. (12) A 5,000-bbl. cat reformer being added.

SCANDINAVIA

• Scandinavia and neighboring Finland continue to be important markets for products from other European countries. Norway, Sweden, and Denmark have the highest per capita consumption in Europe, due to a high standard of living, cold climate, and a lack of domestic fuel supplies.

Refinery capacity is expanding. But there have not been urgent programs by countries to make themselves self-sufficient in refining capacity, as is the case in many areas.

Finland will become more nearly self-sufficient for products sooner than the other countries. An 18,000-bbl.-daily plant under construction at

SWEDEN REFINING

Company—Refinery location—	Bbl. per stream day: Crude dist.	Cracking	Other processing
A. B. Nynas-Petroleum:			
Nynasham	14,000	1,000 TC	TR-1,900
Malmd	[1]1,900	.....	.....
Arendal	(1)	.....	.....
Kopportranz Oljeaktiebolag:			
Skaruik	30,000	.....	TR-4,500, CR-5,500
Total	45,900	1,000	

(1) A 2,600-bbl.-daily refinery under construction.

NORWAY REFINING

Company—Refinery location—	Bbl. per stream day: Crude dist.	Cracking	Other processing
Norske Esso A/S:			
Valloy Pr. Tonsberg	[1]1,800	.....	.....
Total	1,800	.....	

(1) Company has proposed expanding capacity to 30,000 bbl. daily.

PORTUGAL

• Most needs for products in Portugal were met this year by the enlarged refinery of S.A. Concessionaria de Refinacao de Petroles em Portugal (S.A.C.O.R.). Last year, the plant processed 18,400 bbl. daily. It did not operate at its full 22,900-bbl.-daily capacity only because tankage was not completed. The government holds one-third interest in the plant. S.A.C.O.R. has right to supply up to half the country's inland requirements.

Mobil Exploration Portugal, Inc., a Socony Mobil Oil Co., Inc., subsidiary which took over exploration in the country last year, started its third wildcat. The test, projected to 12,000 ft., was located about 6 miles from

RUSSIA-EAST EUROPE

• Crude production made further gains in Russia this year, and appeared to be the most successful phase of the oil industry.

Output averaged 1,600,000 bbl. daily, a rise largely due to continued development of fields in the Volga-Ural area, known as the second Baku. These now account for about 70 per cent of total output. Old Baku areas produce about 22 per cent.

The rate of growth has kept crude supplies adequate for domestic needs, with a little to spare. But the industry still faces major problems, especially transportation. Supplies were tight, at least for a time this year.

Specific details of the condition of the industry are lacking, but Russian publications sometimes highlight shortcomings as a means of prodding personnel to greater effort. Recent complaints indicate that maintenance has been neglected for the sake of quick advances. Around 500 wells completed some time ago are not on production. Another 3,500 old producers are shut in, apparently awaiting workovers. Refinery efficiency is apparently excessively low. About 20,000 bbl. daily had to be reprocessed last year, and a similar amount of products downgraded.

Despite its productive capacity, Russia seems unlikely to increase its own, plus Romanian, exports much above the present 60,000 bbl. daily for any extended time. Internal consumption is growing, and output in old Baku, the source of exports, is fairly level.

The shutdown of the Suez Canal late in October pinched off one of the Soviet supply routes. It cut off about 17,000 bbl. daily which had moved from the Black Sea to Siberia and Red China.

... **Romania.** Oil continues to be the biggest industry in the country. Information is sketchy. But on the basis of claimed output of nearly 216,000 bbl. daily in 1955 and planned output of about 277,000 bbl. daily in 1960, present production should be about 228,000 bbl. daily, by the government's own account.

Fields operated by western companies before World War II are in a state of decline. Secondary-recovery

DENMARK REFINING

Company—Refinery location—	Bbl. per stream day		Other processing
	Crude dist.	Cracking	
Dansk Mineraloliefabrik:			
Copenhagen	65		V-65
A/S Kalundberg Olienaffinaderi:			
Kalvanborg	850		
L. C. Glad Co.:			
Copenhagen	70		
Total	985		

FINLAND REFINING

Company—Refinery location—	Bbl. per stream day		Other processing
	Crude dist.	Cracking	
Neste Oy Corp.—Turku	[1]18,000		
Total	18,000		

(1) Under construction.

Turku will fill about 70 per cent of local needs. It is being built by the government-controlled Neste Oy Corp.

The only other major refinery plan is in Norway, where A/S Norske Esso has asked the government for permission to build a plant at Skjebergkilen, about 50 miles south of Oslo. The company is 56 per cent owned by Standard Oil Co. (N.J.).

Interest in exploration in Denmark was kept alive this year. Jersey Standard carried on negotiations with the government to take over the concession held by Gulf Oil Corp. Jersey reportedly offered to spend $5,000,000 on the concession before it expires in 1960.

Lisbon on the south bank of Tejo River. Two earlier tests were abandoned. Mobil Exploration acquired an interest in exploration under an agreement with Cia. dos Petroleos de Portugal, owned by the government and Axel Johnson interests of Stockholm.

PORTUGAL REFINING

Company—Refinery location—	Bbl. per stream day		Other processing
	Crude dist.	Cracking	
Salor, S.A., Rua do Alecrum 57, Lisbon:			
Cabo Ruivo*	22,900	10,600	Poly-1,400, L-190
Total	22,900	10,600	

*Figures on calendar-day basis.

methods are being employed, however, and in some cases deeper drilling has found new productive horizons. There also has been intensive development of new fields.

Romanian oil trade, dominated by Russia, plays an important part in the Soviet economic empire. Russia has priority on Romanian oil which it buys at fixed prices, believed well below world market prices. Some oil also is exported to Russia or other countries at Russian direction without return, as payment for Russian interests in the national oil operation, which has been turned completely over to the Romanian Government.

. . . **Hungary.** The small Hungarian oil industry was nearly, if not completely, shut down late this year following the political revolt against Russia. But even before the uprising there was a growing shortage of products due to a sharp decline in Nagylengyel, the country's best field, last year, when domestic output barely met local needs, the field produced about 17,000 bbl. daily out of 30,000 bbl. daily. This year, output in the overworked field dropped to 5,400 bbl. daily as a result of water encroachment.

. . . **Poland.** Polish consumption has risen rapidly under its industrialization programs. Observers believe crude output has further lagged behind rising demand and increased little, if any, over 1955 output of 5,400 bbl. daily.

. . . **Bulgaria.** Western visitors were permitted a brief tour of the country's Shabla field for the first time this year. The field, discovered 4 years ago, is near the shore of the Black Sea near the Romanian border. Details of the operation remain a secret, but visitors indicated there were about 50 wells on pump.

. . . **Czechoslovakia.** Fields near the Austrian border continue to be the source of the country's limited crude production, which probably is no greater than the 3,000 to 5,000 bbl. daily level of last year. Limited exploration is centered in the vicinity of the producing area.

. . . **East Germany.** Coal-to-oil synthesis plants continue to be the major source of liquid fuels produced in the country. Several rigs are believed to be in operation. But it is doubtful whether crude output is much over 500 to 600 bbl. daily.

. . . **Albania.** The country is a net exporter of crude and some products, most of which eventually go to other satellites via Russia. Crude output is well over 5,000 bbl. daily, and possibly exceeds 10,000 bbl. daily.

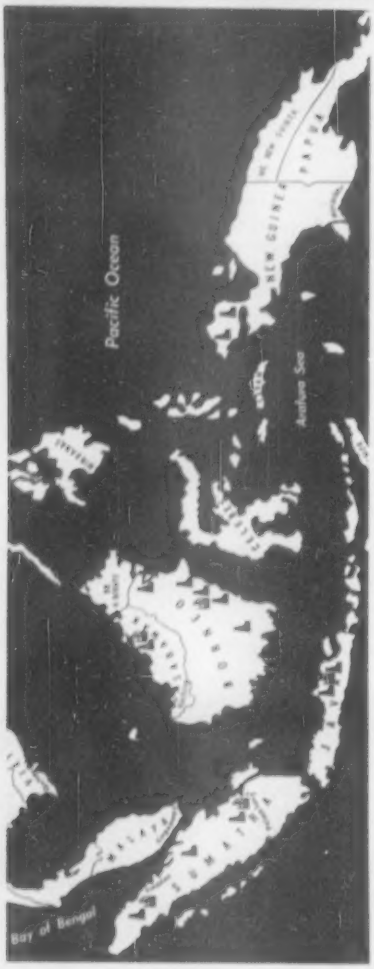
YUGOSLAVIA

● Exploration programs in Yugoslavia were carried on this year by the individual state oil monopolies. Output the first 8 months averaged 5,300 bbl. daily, up slightly over 1955. Most production came from Croatia.

The three refineries in the country had a combined capacity of 18,500 bbl. daily. This level was more than enough to take care of domestic needs and enabled the country to export about 1,800 bbl. daily of products to Western European countries.

SOUTHERN AND EASTERN ASIA . .

INDONESIA



● Indonesia, overshadowed in recent years by the rise of Middle East oil production, produced more oil than ever before this year. Its midyear output of 257,007 bbl. daily was 8.8 per cent more than the same time last year.

The Royal Dutch-Shell operating company, De Bataasfsche Petroleum Mij. had an output of 105,157 bbl. daily from 21 fields. The three leading fields were Tulang Djimar, 19,610 bbl. daily; Limau, 17,216 bbl. daily; and Kenali Asam, 13,003 bbl. daily. All are located in southern Sumatra. Along with other South and Central Sumatran fields, B.P.M. also obtained crude in Java, Ceram, and Kalimantan (Borneo) Islands.

B.P.M. never regained its production in northern Sumatra after World

INDONESIA PRODUCTION
Kalimantan

Name of field and discovery year—	Proved acres	Depth (ft.)	No. wells Flow.	No. wells Pump.	Production, bbl. Daily	Production, bbl. Cumulative	Gravity, °A.P.I.
Anggana-Muaka, 1902		380-3,200	5	82	1,670	67,908,500	20.5-32.1
Balik Papan (Klandasan), 1903†		380-765				241,290	14.7
Munju, 1930		2,020-7,850	33		8,950	6,377,550	24.5-33.1
Sambodja, 1910		160-4,400		48	906	56,680,520	23.3-31.1
Sanga Sanga, 1897		430-2,900	5	83	3,158	154,296,840	20.8-32.1
Sangatta, 1940†		1,640-4,200				1,150	36.0
Tandjung, 1938*		2,500-4,300	1		‡136	844,290	38.6
Tarakan, 1906		195-2,400	2	405	3,965	176,674,150	18.2
Total Kalimantan			48	618	18,785	463,024,290	
Ceram							
Bula Lemum, 1897†		240-920				8,203,000	23.0
Total Ceram						8,203,000	
Java							
Kawengan, 1926		1,750-2,700		79	8,611	65,266,210	33.9
Kruka, 1929		970-1,600		51	611	8,767,650	28.0
Ledok, 1896†		320-3,200				21,299,790	43.0
Lidah Kuldon, 1896†		490-1,330				33,369,000	24.5
Nglobo-Semanggi-Banjuasin, 1897†		370-3,350				18,604,190	43.0
Total Java				130	9,222	147,306,840	

*Field shut in, pipeline not available. †No activity. ‡Production for own use.

SUMATRA PRODUCTION
(Southern District)

Name of field and discovery year—	Proved acres	Depth (ft.)	No. wells Flow.	No. wells Pump.	Production, bbl. Daily	Production, bbl. Cumulative	Gravity, °A.P.I.
Abab, 1951*		6,000			600	1,044,817	35.0
Babat, 1901		100-1,050	1	19	45	8,437,130	39.2
Badjubang, 1927		2,700-3,300	11	22	2,668	35,538,310	46.7
Benakat, 1933*		1,500			15,300	69,769,790	36.0
Betun, 1949*		6,500			800	2,891,259	35.0
Betung, 1923†		180-950				2,165,770	40.5
Djirak, 1930*		900			3,200	38,163,076	37.0
Gunung Kemala, 1938		6,200-6,340	17	3	5,146	11,121,630	38.1
Karang Rining, 1903†		160-1,200				1,510,110	42.5
Kenali Asam, 1931		1,150-4,020	27	76	13,003	54,748,790	24.3-44.8
Kluang, 1914†		2,300-2,600				26,704,430	40.0
Kruh, 1941*		3,300			100	1,457,829	38.0
Limau, 1928		4,450-5,350	34	11	17,216	28,289,910	30.1
Mangundjaja, 1935		660-2,200		46	1,882	15,580,820	24.4
Meruo Senami, 1938		2,400-2,650	3	3	379	149,980	46.9
Muara Enim Complex, 1903		300-1,150				28,681,120	42.2
Prabumlih West, 1953		4,740-5,640	6	1	3,211	3,015,050	31.5
Radja, 1940*		6,500			3,800	9,554,295	40.0
Setiti, 1936		1,850-1,970	1		75	9,650	40.1
Suban Djerigi, 1905		1,300-2,500		17	542	36,304,430	49.9
Talang Akan-Pendopo, 1922*		2,800			40,000	247,851,101	37.0
Talang Djimar, 1937		3,600-4,200	51	43	19,610	88,800,880	29.1
Tandjung Tiga, 1940		4,400-4,600	9	24	5,762	14,581,290	26.9
Tempino, 1931		1,930-2,700	4	88	7,611	56,247,880	46.3
T. Luntar, 1912†		2,200-2,800				4,312,090	56.0
Total Southern District			§164	§353	140,950	786,931,437	

(Northern District)†

Name of field and discovery year—	Proved acres	Depth (ft.)	No. wells— Flow.	Pump.	Production, bbl.— Daily	Cumulative	Gravity, °A.P.I.
Djrajeu, 1929		2,520-2,590				559,000	54.5
Gebang, 1936		2,970-3,400				135,000	54.0
Pangkatan Susu, 1917		1,550-2,100				6,287,000	56.0
Pace, 1939		2,520-2,590				559,000	34.5
Pulu Pandjang, 1928		1,640-2,400				11,243,000	55.5
Perlack, 1900		160-2,200				47,870,000	57.0
P. Tabuhan, 1937		3,300-3,500				3,283,000	52.5
Rantau, 1929		1,040-2,560				55,513,000	48.5
Serang Djaja, 1926		3,560-4,150				7,551,000	64.5
Telaga Said D.K.G., 1893		210-720				23,621,000	51.5
Total Northern District						156,062,000	
Total Sumatra			§292	§361	229,000	1,020,278,155	
Total Indonesia			340	1,109	257,007	1,638,812,285	

*No breakdown of wells by fields available. †No activity. ‡Shut in awaiting completion of pipeline. §Plus 601 producing wells, flowing and gas lift, operated by Standard Vacuum in Southern and Central Divisions of Sumatra. ¶Produced for own use.

(Central District)

Bekasap, 1955		2,400				129	35
Duri, 1940	3,000	730				52,732	22
Kotabatak, 1952	400	4,800				¶4,896	32
Lirik, 1939‡		1,800				123,416	34
Minas, 1944	30,800	2,460	128	8	87,000	76,013,198	36
Molek, 1956*		2,700				908	34
Pungut, 1951	600	2,940				¶12,025	39
Sago, 1940*		1,800			1,000	1,051,943	34
Sebanga, 1940	300	1,200				¶2,369	30
South Pulai, 1941*		1,800			50	23,102	34
Total Central District	35,100		128	8	88,050	77,284,718	

INDONESIA REFINING

Company—Refinery location—	Bbl. per stream day— Crude dist.	Cracking	Other processing
N.V. de Bataafsche Petroleum Mij.:			
Balik Papan*	56,000		
P. Brandan†			
Pladju*	95,000	10,000 TC	TR-15,000
Tjepu*	4,600		
Wonokromo*	3,200		
N.V. Standard-Vacuum Pet. Mij.:			
Sungei Gerong	71,000	(1)	V-34,500, Alky-800
Total	229,800	10,000	

*Figures on calendar-day basis. †Refinery impossible to operate. (1) A 11,400-bbl. cat cracker and a 4,370-bbl. poly unit under construction.

NETHERLANDS NEW GUINEA PRODUCTION

Name of field and discovery year—	Proved acres	Depth (ft.)	No. wells— Flow.	Pump.	Production, bbl.— Daily	Cumulative	Gravity, °A.P.I.
Klamono, 1936		300-680	1	18	4,760	13,244,920	18.9
Mogoi, 1940		1,050-1,870		26	1,009	3,725,370	43.0
Wasian, 1940		2,950-3,370	5	3	1,015	685,310	42.2
Total			6	47	6,784	17,655,600	

War II. The 10 fields in the district produced about 20,000 bbl. daily before the war. The matter has been under negotiation. But late this year the government decided against returning the fields to the company. About 150 bbl. daily is produced from the area.

Caltex was the second ranking producer with an output of 87,000 bbl. daily from Minas field in Central Sumatra. Output came from 136 wells averaging 640 bbl. daily. Of 12 development wells drilled the first half of 1956, 11 were producers and 1 a dry hole. The company planned 16 more development wells in the second half.

Standard-Vacuum Oil Co., the third producer in the country, had an output of 64,850 bbl. daily from nine fields in Central and southern Sumatra. The two best fields were in South Sumatra, Talang Akar-Pendopo, with 40,000 bbl. daily, and Benakat, 15,300 bbl. daily.

Stanvac completed 10 out of 10 development wells as producers the first half. One wildcat made a new field discovery at Molek. Two other wildcats were dry. The company expected to drill 25 more development and 6 more wildcat wells by the end of the year.

The company's operating subsidiary, Standard-Vacuum Petroleum Mij. currently has an $80,000,000 capital investment program under way in the country. This includes a $20,000,000 modernization program at its 71,000-bbl.-daily Sungei Gerong refinery. Other refineries in the country are operated by B.P.M.

NEW GUINEA

● Exploration in Papua had its most promising year so far. A jungle wildcat, 1 Kuru, struck a high-pressure gas formation at 998 ft. The well blew out with an estimated flow of 50,000 M.c.f. daily. After running wild for 6 months, it was brought under control in June by a successful slant-hole operation. Plans for an additional $14,000,000 program this year and next followed the discovery.

Australian Petroleum Co., Ltd., and Island Exploration Co., Ltd., are the operating companies. Standard-Vacuum Oil Co. and British Petroleum Co., Ltd., are the major owners. Oil Search, Ltd., an Australian firm, has a 10 per cent interest.

Exploration continued in Netherlands New Guinea, the western half of the island. But the three small producing fields continued to decline, although a deeper pay zone was found late in 1955 in Wasian field. Output the first 7 months was 7,000 bbl. daily, compared with the 1955 average of 9,400 bbl. daily. The operating company, Netherlands New Guinea Petroleum Co., is owned by Royal Dutch-Shell, 40 per cent; Stanvac, 40 per cent; and Caltex 20 per cent.

BRITISH BORNEO

●British Malayan Petroleum Co., Ltd. (Royal Dutch-Shell), increased British Borneo production to 116,213 bbl. daily at midyear, up 6.5 per cent over the same date in 1955.

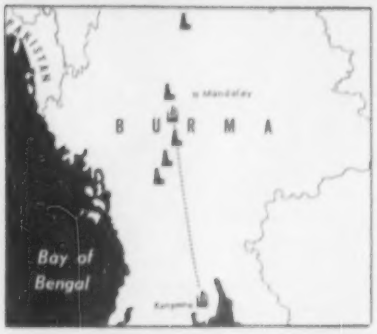
This increase was due largely to offshore development of Seria field, which produces about 99 per cent of the area's crude and is the most prolific field in the Far East. With the onshore portion of the structure just about fully developed, British Ma-

BRITISH BORNEO PRODUCTION
(State of Brunei)

Name of field and discovery year—	Proved acres	Depth (ft.)	No. wells— Flow.	Pump.	Production, bbl.— Daily	Cumulative	Gravity, °A.P.I.
Seria, 1929	....	1,300-7,300 (State of Sarawak)	139	*155	114,833	†344,580,712	19-38
Miri, 1911	....	300-3,050	....	180	1,380	†73,972,616	21.5-35.0
Total			139	335	116,213	418,553,328	

*Includes 120 artificial-lift wells. †Includes estimate of production by Japanese.

BURMA



● Limited expansion in Burma continued in 1956 but the industry is still only about one-fifth as big as it was before World War II.

The 3,000-bbl.-daily refinery at Chauk field is the only plant in operation. Syriam refinery, near Rangoon, is being partially rebuilt to further

BURMA PRODUCTION

Name of field and discovery year—	Proved acres	Depth (ft.)	No. wells— Flow.	Pump.	Production, bbl.— Daily	Cumulative	Gravity, °A.P.I.
Chauk-Lanya, 1902	....	2,500	5	109	3,400	296,000,000	36
Others	....	....	....	....	1,100	....	....
Total			5	109	4,500	296,000,000	

INDIA

INDIA PRODUCTION

Name of field and discovery year—	Proved acres	Depth (ft.)	No. wells— Flow.	Pump.	Production, bbl.— Daily	Cumulative	Gravity, °A.P.I.
Digboi, 1890	....	3,000	30	*570	....	....	36.0
Nahorkatiya, 1953	....	10,000	†4	....	....	....	34.0
Total			34	570	‡9,200	‡56,600,000	

*Includes 380 wells on gas lift. †Nine more wells shut in. ‡Both fields.

● Development drilling in Upper Assam this year showed that India, one of the countries short on oil supplies, has a major source of crude.

Late this year estimates were that Nahorkatiya field could produce 50,000 bbl. daily for 20 years. This indicates proved reserves at better than 365,000,000 bbl. It means that the field could fill at least 56 per cent of India's crude requirements at the present rate of consumption.

Increased production is snagged, however, on the question of where to locate a refinery to process the crude. The government wants to build a plant near the field, where northern Indian markets could be served. Assam Oil Co., which developed the field after discovering it in 1953, wants to build the plant at Calcutta, where it says the refinery would have the greatest economic advantage.

PHILIPPINES

● Interest centered on a wildcat drilled by Philippine Oil Development Co. (PODCO) in Cagayan Valley of northern Luzon, an area where American and Filipino companies have extensive concessions. The well, 1 Tumauini, was abandoned at 10,414 ft. due to mechanical trouble without reaching its objective, Oligo-Miocene sands. Noncommercial shows of gas and oil were met in a number of zones. A second test west of the first is scheduled in January. Standard-Vacuum Oil Co. will drill its first test early in 1957 in the same region.

PODCO, a local company, has cross-option agreements with Stanvac and Caltex companies if commercial

BRITISH BORNEO REFINING

Company—Refinery location—	Bbl. per stream day: Crude dist.	Cracking	Other processing
Sarawak Oilfields, Ltd., Miri:			
Lutong*	47,500		
Total	47,500		

*Figures on calendar-day basis.

layan has concentrated on offshore drilling. Four platforms are in operation and three more are being added. Five more platforms are scheduled to be built in 1957.

Another spur to offshore work was disappointing exploration results on land. A discovery late in 1955, Jerudong, gave hope of being the first major discovery in the area since before World War II. But stepouts failed to live up to promise.

BURMA REFINING

Company—Refinery location—	Bbl. per stream day: Crude dist.	Cracking	Other processing
Burmah Oil Co. (Burma Concessions), Ltd.:			
Chauk	3,000		
Syriam	(1)		
Total	3,000		

(1) Company partially rebuilding refinery destroyed in World War II, 3,500-bbl. crude unit due to go on stream in early 1957.

meet domestic demand. Its 3,500-bbl.-daily capacity is expected to be completed early next year. Crude production is tailored to meet refinery needs.

Burma Oil Co. (1954), Ltd., operates the country's industry. It is one-third owned by the government. The remaining interest is held largely by Burmah Oil Co., Ltd., and by two smaller companies, British Burmah Petroleum Co., Ltd., and Indo-Burma Petroleum Co., Ltd.

INDIA REFINING

Company—Refinery location—	Bbl. per stream day: Crude dist.	Cracking	Other processing
Assam Oil Co., Ltd.—Digboi	5,900	1,500 TC	
Burmah-Shell Refineries, Ltd.—Bombay*	40,000	12,000 FCC	CR-6,700
Caltex (India), Ltd.—Visakhapatnam	(1)	(1)	(1)
Standard-Vacuum Refining Co. of India—Bombay	27,800	5,100 FCC	TR-4,200, Poly-1,225
Total	73,700	18,600	

*Figures on calendar-day basis.
(1) 13,500-bbl. per calendar day refinery due to go on stream in 1957, will include 7,400-bbl. fluid cat cracker and 750-bbl. cat poly unit.

Earlier in the year, A.O.C., a Burmah Oil Co., Ltd., subsidiary, and the government agreed on the participation each would have in the development of Nahorkatiya oil. A.O.C. will have two-thirds interest in production and one-third interest in refining. The government will have one-third interest in production, and two-thirds in refining.

Meanwhile, output from Nahorkatiya and the declining Digboi field nearby, was 9,200 bbl. daily at mid-year. Nahorkatiya's share of the output came from four flowing wells. Late this year, the field had a total of 19 producing wells, most of them shut in.

Standard-Vacuum Oil Co. is the only American firm with a concession in the country. The company plans to start drilling early in 1957 on a 10,000-sq.-mile concession in the Bengal basin. The Indian Government itself is carrying on exploration. It set up a commission this year for this purpose, and was advised by Russian experts and purchased some Russian equipment.

The third of three new refineries will go on stream in 1957. It is Caltex's 13,500-bbl.-daily plant at Visakhapatnam, on the East Coast. The other new refineries are at Bombay.

oil is discovered. Stanvac plans to drill in the area early in 1957. San Jose Oil Co., Inc., jointly owned by Pantepec Oil Co. and Pancoastal Petroleum Co., acquired concessions in the islands this year.

PHILIPPINE REFINING

Company—Refinery location—	Bbl. per stream day: Crude dist.	Cracking	Other processing
Caltex (Philippines), Inc.—Batangas*	13,000	5,400 FCC	V-7,500, P-560
Total	13,000	5,400	

*Figures on calendar-day basis.

PAKISTAN

• Exploration continued at a rapid pace in Pakistan, a country made attractive by large sedimentary areas, favorable laws, and major natural-gas discoveries in the recent past.

Pakistan Petroleum, Ltd., this year called its Sylhet discovery in East Pakistan a major natural-gas field. Drilling on 2 Sylhet was suspended in October at 9,245 ft. because of high-pressure gas. The discovery well cratered last year after hitting a high-pressure formation. Meanwhile, the company's Sui gas field in West Pakistan was on commercial production, supplying an increasing number of industrial users during the year. The field, one of the world's largest, was found in 1953.

PAKISTAN PRODUCTION

Name of field and discovery year—	Proved acres	Depth (ft.)	No. wells Flow.	No. wells Pump.	Production, bbl. Daily	Production, bbl. Cumulative	Gravity, °A.P.I.
Balkassar, 1946*	....	8,000	4	....	1,300	3,300,000	26.0
Dhulian, 1937	....	7,600-9,200	....	....	....	....	36.2-45.0
Joya Mair, 1944	....	7,000	....	....	....	....	19.0
Khaur, 1915	....	5,200	....	....	....	....	36.0
Total	....	....	4	....	†5,100	6,481,735	....

*Excludes Attock Oil Co. share. †Pakistan total includes Attock Oil Co., Ltd., operations.

The company, a Burmah Oil Co., Ltd., subsidiary, continued to have the leading role in exploration in the country, with several rigs running on various concession blocks. It has spent nearly $17,000,000 on exploration activity during the past 6 years.

Royal Dutch-Shell became the fifth company to enter the country when it obtained a 10,000-sq.-mile concession in West Pakistan, and an equal area in East Pakistan this year. Most of the

JAPAN

JAPAN PRODUCTION

Akita Prefecture

Name of field and discovery year—	Proved acres	Depth (ft.)	No. wells Flow.	No. wells Pump.	Production, bbl. Daily	Production, bbl. Cumulative	Gravity, °A.P.I.
Hachimori, 1938	90	1,480	....	....	63	925,249	26
Yabase, 1939	1,770	320-5,580	....	....	3,754	18,601,916	28-36
Innai, 1934	135	2,540	....	....	337	5,053,875	22
Others	....	....	....	....	506	(*)	....
Total	....	....	....	1,572	4,660	....	....

Yamagata Prefecture

Ishinazaka, 1944	15	650	....	....	174	690,333	18
Mogami, 1952	25	1,500-2,550	....	....	44	71,698	17-28
Others	....	....	....	....	19	(*)	....
Total	....	....	....	75	237	....	....

Niigata Prefecture

Niitsu, 1896	265	420-4,270	....	....	415	19,005,163	18.6
Higashiyama, 1893	200	590-2,100	....	....	172	7,440,675	33.4
Nishiyama, 1897	415	1,050	....	....	162	12,473,680	37.4
Others	....	....	....	....	100	(*)	....
Total	....	....	....	1,608	849	....	....
Others	....	....	....	232	56	*32,514,974	....
Total Japan	....	....	....	3,487	5,800	96,777,563	....

*Accumulative total includes totals from all small miscellaneous production in Japan.

FORMOSA REFINING

Company—Refinery location—	Bbl. per stream day: Crude dist.	Bbl. per stream day: Cracking	Other processing
Chinese Petroleum Corp.—Kaoshiung	28,000	10,000 TCC	V-1,200, Vis-4,000 [1]CH-3,000, A-800, CT-3,000
Total	28,000	10,000	....

(1) Planned.

• The Japanese refining industry, which has grown steadily since permission for reopening was granted in July 1949, reached a capacity of 293,800 bbl. daily at midyear. Additional crude capacity under construction at eight refineries totals 131,000 bbl. daily. Another 27,000 bbl. daily in catalytic cracking and 17,600 bbl. daily in catalytic reforming also are under way.

Several foreign companies have in-

PAKISTAN REFINING

Company—Refinery location—	Bbl. per stream day: Crude dist.	Cracking	Other processing
Attock Oil Co., Ltd.—Rawalpindi	5,000		
Total	5,000		

acreage covers offshore areas. Under the agreement, Shell owns 75 per cent of the operating company, Pakistan Shell Oil Co., Ltd. A private Pakistani company, Petroleum Development of Pakistan, Ltd., has the remaining 25 per cent. Profits will be shared 50-50 with the government if commercial oil is found.

Private Pakistani capital or the government also hold an interest in all other operating companies. There also is provision for a 50-50 profit split in all cases. P.P.L. had operated under different terms. But it reached a new agreement in line with other companies this fall.

Standard-Vacuum Oil Co., which has two 5,000-sq.-mile blocks in East Pakistan, started its first well in May, about 130 miles east of Karachi. Hunt International Oil Co. has two 10,000-sq.-mile sections in West Pakistan. A well was started this year in the block along the coast toward the Iranian frontier.

Sun Oil Co. indicated it might be the next company to engage in exploration in Pakistan when it formed a new subsidiary, Pakistan Sun Oil Co., in November.

P.P.L. produced 1,300 bbl. daily this year as its share of output from Balkassar field. Pakistan Oilfields, Ltd., a subsidiary of Attock Oil Co., Ltd., produced the remainder of the country's output.

JAPAN REFINING

Company—Refinery location—	Bbl. per stream day: Crude dist.	Cracking	Other processing
Aisia Oil Co.—Yokohama	[10]5,000		
Daikyo Oil Co.—Yokkaichi	25,000	3,500 FCC	([1])
Idemitsu Kosan—Tokuyama	([12])	([12])	([12])
Kita Nippon—Sekiyu-Hakodate	([13])		
Koa Oil Co.—Marifu*	25,000	1,400 TC	[2]Pf-1,500, L-320, A-75
Maruzen Oil Co.:			
Shimotsu	37,500	3,000 FCC	
Matsuyama	10,000		([3])
Mitsubishi Oil Co.—Kawasaki	[4]29,400	3,000 TC	Pf-1,500
Nihon Mining Co.—Funakawa	15,300		
Nippon Oil Co.:			
Akita	4,000	1,000 TC	
Niigata	[5]3,600		
Kashiwazaki	1,500		
Nippon Pet. Refg. Co.:			
Yokohama*	40,000	5,000 FCC	V-6,100, L-1,300, A-750
Kadamatsu	15,000		Pf-1,200, L-500, A-500
Muroran†	([5])		
Showa Oil Co.:			
Kawasuki	[7]12,000		Pf-1,500
Hirasawa	3,000		
Niigata	11,000		
Yokkaichi	([2])		
Toa Nenryo Kogyo Co.:			
Wakayama	47,000	3,900 TC ([9])	CR-4,670, V-4,500, [9]L-750
Shimizu	7,000		V-3,400, L-500, A-300
Toa Oil Co.—Kawasaki	6,000		
Taiyo Oil Co.—Kameoka	1,000		
Total	293,800	20,400	

*Calendar-day basis. †Fifty per cent owned by Nippon Oil Co.

(1) A 3,000-bbl. cat reformer under construction. (2) A 1,600-bbl. cat reformer under construction. (3) A 3,000-bbl. cat reformer under construction. (4) A 25,000-bbl. crude unit under construction plus 3,000-bbl. cat reformer. (5) A 7,500-bbl. crude unit under construction. (6) A 10,000-bbl. crude unit under construction. (7) A 15,000-bbl. crude unit under construction. (8) A 37,500-bbl. refinery under construction, including 10,000-bbl. cat cracker and 3,000-bbl. cat reformer. (9) A 10,000-bbl. cat cracker and a 1,040-bbl. alkylation unit building. (10) A 6,000-bbl. crude unit under construction. (11) A 1,000-bbl. cat reformer under construction. (12) A 20,000-bbl. daily refinery under construction, including a 7,000-bbl. cat cracker and a 3,000-bbl. cat reformer. (13) A 10,000-bbl. crude unit under construction.

terests in Japanese refineries, usually through affiliates. Standard-Vacuum Oil Co. has 55 per cent interest in Toa Nenryo, K.K. Firms with a 50 per cent interest in refining companies are: Caltex, in Nippon Petroleum Refining Co., Ltd., and Koa Oil Co., Ltd.; Tide Water Associated Oil Co., in Mitsubishi Oil Co., Ltd.; and Royal Dutch-Shell, in Showa Oil Co.

Petrochemicals also are becoming a major industry. The government hopes production reaches 200,000 tons yearly by 1959-60 under a 5-year plan. The two companies which first gained approval for individual projects were Mitsui Oil Chemicals and Sumitomo Chemical Industries.

The Japanese Petroleum Exploration Co. was formed in December 1955. Its goal is to increase crude output to 18,000 bbl. daily within 5 years. The government has one-half interest. Teikoku Oil Co., Ltd., which continued to operate established fields has 25 per cent interest, and local refining companies the remaining 25 per cent.

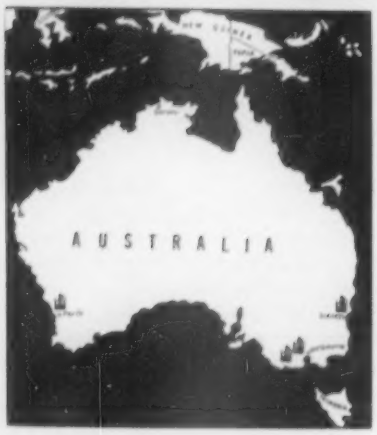
Teikoku Oil Co. early this year brought in a rig capable of going below 12,000 ft., which would be considerably deeper than any previous test.

FORMOSA

● Chinese Petroleum Corp. put into operation this year a 10,000-bbl.-daily Thermofor catalytic cracker at its 28,000-bbl.-daily Kaoshiung refinery. The Nationalist Chinese Government company financed the unit, as well as a 3,000-bbl.-daily Catformer completed in 1955, by long-term loans from American oil companies with an assist from International Cooperation Administration.

Crude output from four small fields averaged 65 bbl. daily last year.

AUSTRALIA



• The fourth and final major refinery project undertaken in Australia in recent years was completed in 1956 when Caltex's 22,000-bbl.-daily plant at Kurnell went on stream.

The commonwealth now is self-sufficient in refining, at least for the time being. Its present crude capacity of 182,200 bbl. daily compares with the 20,000-bbl.-daily capacity in 1951 when the country was affected by the shutdown of Abadan refinery in Iran.

British Petroleum Co. Ltd.'s 70,000-bbl.-daily refinery at Kwinana, and Standard Vacuum Oil Co.'s 29,200-bbl.-daily Altona plant opened in 1955. The Shell Group's 36,000-bbl.-daily Geelong refinery opened in 1954. B.P. and Shell now plan to add several thousand barrels daily capacity in new special process units. A 2,300-bbl.-daily Platformer also is planned by Bitumen & Oil Refineries (Australia) at its 15,000-bbl.-daily Matraville plant. This refinery is owned 40 per cent by Caltex, and 60 per cent by local interests.

Western Australian Petroleum Pty.,

LATIN AMERICA . . .

VENEZUELA

• Several developments made 1956 a memorable year in Venezuela, the world's second largest crude producer.

Highlight of the year, and one of the leading events in the world-wide industry, was the granting of new concessions for the first time in 11 years. Competition was fierce for the semiproved acreage of Lake Maracaibo. Concession blocks also were awarded in other areas of the State of Zulia, and in Apure and Tachira. Successful companies offered more than $330,000,000 for a total of 893,727 acres. In addition, the government received royalty commitments as high as 20 and 25 per cent, along with side benefits known as "special advantages to the nation."

WESTERN VENEZUELA PRODUCTION

Name of field and discovery year—	Proved acres	Depth (ft.)	No. wells—Flow.	No. wells—Pump.	Production, bbl.—Daily	Production, bbl.—Cumulative	Gravity, °A.P.I.
State of Barinas							
Barinas, 1953		8,579-9,046	*1		218	114,889	25.4
Silvestre, 1945		8,858	†1		222	205,989	24.4
Total Barinas			2		440	320,878	
State of Trujillo							
Motatan, 1938		8,850	4		2,159	1,911,903	21.0
Total Trujillo			4		2,159	1,911,903	
State of Falcon							
Cumarebo, 1913		1,968	12	24	2,395	51,057,120	48.1
Mamon, 1926		3,350	(*)			486,675	35.2
Mene Mauros, 1921		600-1,850	5	39	1,680	27,603,125	38.5
Hombre Pintado, 1927		1,000		27	397	5,767,689	25.9
Tiguaje, 1953		3,328-3,348	7		1,581	882,332	27.8
Total Falcon			24	90	6,053	85,796,941	
State of Zulia							
Bachaquero, 1930		3,444	218	1,216	382,878	568,837,900	13.1-17.8
Boscan, 1946		6,500-7,500		151	50,731	62,692,432	10.2-10.5
Cabimas, 1917		2,200	133	744	71,445	790,476,930	17.3-25.4
Concesiones Lacustres, 1947		6,262-8,386	71		131,874	45,126,308	31.4
El Cubo, 1916		984	28	116	19,569	151,440,208	36.6
Ensenada, 1948		8,550	1		45	472,472	57.4
La Concepcion, 1935		3,148-8,000	18	61	13,021	54,415,420	36.7
Lagunillas, 1926		3,000	264	1,083	636,901	2,749,050,551	13.5-20.3
La Paz, 1925		4,264-8,000	21	61	98,392	460,218,201	33.1
Mara, 1945		5,248	27	23	79,053	237,874,136	29.5-30.3
Mene Grande, 1914		4,132	3	462	40,092	448,554,715	17.8
Pueblo Viejo, 1940		1,968	19	20	9,510	19,405,166	13.2-13.7
Sibucara, 1948		13,451	5		6,311	22,178,766	37.9
Tia Juana, 1928		3,000	191	1,085	244,421	1,053,515,871	12.6-26.9
Total Zulia			999	5,022	1,784,243	6,664,259,076	
Total West. Venezuela	420,000		1,029	5,112	1,792,895	6,752,288,798	

*Another nine wells shut in awaiting pipeline completion. †Seven more wells shut in awaiting pipeline completion.

*Five wells shut in.

Ltd., (WAPET), owned 80 per cent by Caltex and 20 per cent by Ampol, a local firm, continued its exploration program in West Australia this year. The company undertook a structure drilling project to drill about 24 holes, most of them in the Exmouth Gulf area.The shallow testing was the outgrowth of disappointing results in deep wildcats following the 1 Rough Range discovery in December 1953. Australia's deepest test, the 2 Cape Range, was abandoned early this year at 15,188 ft.

AUSTRALIA REFINING

Company—Refinery location—	Bbl. per stream day— Crude dist.	Cracking	Other processing
B P Refinery (Kwinana), Ltd.—Kwinana	70,000	12,500 FCC	V-24,000, [1]Pf-6,000, CH-5,600, A-500
Australian Oil Refining, Ltd.—Kurnell*	22,000	13,000 FCC	V-13,900, Poly-1,450
Bitumen & Oil Refineries (Australia)— Matraville*	15,000		[2]Pf-2,300, [3]A-50,000, [4]CH-7,700
Commonwealth Oil Refineries, Ltd.— Laverton	([5])		
Shell Refining (Australia), Ptg., Ltd.: Clyde*	10,000		[6]CR-6,700
Geelong*	36,000	13,000 FCC	Pf-6,700
Standard-Vacuum Refining Co., Ltd.— Altona	29,200	9,200 TCC	V-1,400, Sova-5,500, Alky-1,600, A-1,000
Total	182,200	47,700	

*Figures on calendar-day basis.
(1) Additional 10,000-bbl. Platformer planned. (2) Planned. (3) Long tons per year. (4) Planned. (5) A 4,200-bbl. refinery shut down. (6) Due on stream first quarter, 1958.

VENEZUELA REFINING*

Company—Refinery location—	Bbl. per stream day— Crude dist.	Cracking	Other processing
Cia. Shell de Venezuela, Ltd.: Cardon	[1]145,000	25,000 TC	TR-8,500, L-3,000, Poly-1,500, V-19,000
San Lorenzo	[2]38,000		
Colon Development Co., Ltd.: Calvario	1,000		
Casieua	300		
La Rivera	300		
Creole Petroleum Corp.: Amuay	[3]235,500		V-89,000, CR-11,000, A-59,400
Caripito	68,000	36,000 Vis	
Phillips Petroleum Co.: San Roque	[4]3,200		
Richmond Exploration Co.: Bajo Grande	[5]10,000		A-7,700
Sinclair Oil & Refining Co.: Puerto La Cruz	35,000	12,000 Vis	
Texas Petroleum Co.: Tucupita	10,000		
Venezuela Gulf Refining Co.: Puerto La Cruz	59,000	14,500 Vis	
Total	605,300	87,500	

*Figures on calendar-day basis. (1) Current throughput 177,500 bbl. per day, 80,000-bbl. crude unit due on stream in 1958, 33,000-bbl. cat cracker due on stream mid-1957, 2,300 bbl. alkylation. (2) Current throughput 39,500 bbl. (3) A 110,000-bbl. crude unit, 658-bbl. lube plant, 17,000-bbl. diesel-oil Hydrofiner planned. (4) A 3,500-bbl. crude unit planned. (5) Combination atmosphere-vacuum distillation unit, 20,000-bbl. atmosphere crude unit planned.

Mene Grande Oil Co., a Gulf Oil Corp. subsidiary, came out on top in the bidding, acquiring 126,829 acres in Maracaibo for $124,800,000. It paid another $1,800,000 for 98,840 acres in Apure. Cia. Shell de Venezuela was second. It got 59,605 acres in the lake for $62,100,000, and paid $900,000 each for blocks of 49,420 acres in Zulia and Tachira.

Creole Petroleum Corp., a Standard Oil Co. (N. J.) company, obtained 25,441 acres in Maracaibo and 98,840 acres in other areas, paying a total of $24,800,000. Superior Oil Co. paid $20,850,000 for 7,774 acres in Maracaibo and 24,710 acres in Apure.

Sun Oil Co. and Atlantic Refining Co. jointly bid and acquired 24,710 acres in Maracaibo and an equal area of Apure for $17,550,000. A four-company group consisting of Signal Oil & Gas Co., Hancock Oil Co., Sohio Petroleum Co., and Pure Oil Co. obtained 27,608 acres in the lake, and 74,130 in Zulia for $32,500,000. Venezuelan Leaseholds, headed by a Venezuelan and financed by local British and American stockholders, got 1,969 acres in Maracaibo and 24,710 acres in Apure for a total of $4,050,000.

Considerable business secrecy surrounded two of the participating companies. Backers of Star Oil Co. and of Venezuelan American Independent Oil Producers Association kept their identities hidden from the general industry. Star acquired 24,710 acres in Maracaibo and an equal area in another state for a total of $18,450,000.

Venezuelan American offered $21,600,000 for 26,571 acres in Maracaibo and 98,840 acres in other Zulia areas. It farmed out one 2,078-acre block in Maracaibo to Atlantic Refining and Sun Oil. But it lost five border blocks in November by failing to pay bonuses in time.

Crude production was at a record high this year, and is continuing to

(Venezuela continued on next page)

increase at maximum efficient rates. Output the first 9 months averaged 2,399,600 bbl. daily. With added pressure for more crude caused by the Suez shutdown, production on individual days late in November passed 2,600,000 bbl.

Creole continued to be the leading producer, averaging 1,055,100 bbl. daily. Shell produced 692,700 bbl. daily; Mene Grande, 353,800 bbl. daily; Socony Oil Co. de Venezuela, 93,400 bbl. daily; Soc. Anon. Petrolera las Mercedes, 24,000 bbl. daily; Richmond Exploration Co. (California Standard), 53,500 bbl. daily; Texas

EASTERN VENEZUELA PRODUCTION
State of Anzoategui

Name of field and discovery year—	Proved acres	Depth (ft.)	No. wells— Flow.	Pump.	Production, bbl.— Daily	Cumulative	Gravity, °A.P.I.
Apamate, 1951		6,670	1		33	10,634	36.5
Araibel, 1954		10,516	15	1	8,840	4,540,925	35.7
Boca, 1951		9,500	30	3	10,732	22,102,482	33.3-34.3
Bruzual, 1954		2,900			179	68,679	41.1
Cachama, 1952		7,724	3		390	315,328	33.6
Caico Seco, 1946		6,500-7,300	14	13	6,324	11,310,616	37.7
Cascaroncito, 1953		8,968				21,068	44.0
Cerro Pelado, 1951		4,400			26	106,602	42.1
Chimire, 1948		7,000-7,200	93	11	39,398	110,142,662	34.2-36.3
Dacion, 1951		6,700	61	23	29,790	48,421,237	22.9-22.7
El Roble, 1939		3,500-11,560	12	10	2,482	27,492,607	43.4-44.9
Esquina, 1951		4,360	2		748	701,863	41.7
El Toco, 1948		9,000	12	1	3,706	9,981,993	39.3
Flecha, 1953		5,736	2	1	509	400,854	34.9
Fria, 1948		6,500-7,300	4	14	3,001	5,710,585	35.6
Guara, 1942		5,000-10,000	114	117	46,935	258,142,130	32-37.4
Guara-500			6	9	3,219	585,920	20.1
Guario, 1940		5,000-10,000	17	3	6,429	26,501,498	43.5
Guavinita, 1948		3,500	4	8			
Guere, 1951		7,800	18	15	7,683	15,808,267	37.3
Guico, 1944		4,500-7,000	24	24	5,575	46,523,438	32.4
Inca, 1948		7,100	1	1	68	608,571	38.3
Isla, 1954		5,470	1		232	372,608	43.2
Junta, 1954		6,720	6	6	1,965	1,761,017	22.7
La Ceibita, 1953		9,871-9,878	4		2,113	1,066,004	35.6
La Vieja, 1951		2,570	2	10	752	1,839,614	25.5
Las Adjuntas, 1954*		7,000-7,200				68,440	26.6
Leona, 1938		8,000	33	17	15,793	31,165,127	29.7
Lobo, 1952		6,400	2	3	1,284	1,450,192	26.6
Los Mangos, 1950		7,743	1		246	215,540	40.8
Mapiri Este, 1949		9,500	7		2,173	11,358,807	37.1
Mata, 1951		11,520	52		24,899	17,111,222	31.6-33.4
Merey, 1937		5,700	4	35	4,284	5,254,370	15.7-20.0
Nipa, 1945		6,000-8,500	163	34	71,037	105,014,666	33.3-39.1
Oficina, 1937		5,900	107	197	55,952	286,121,558	30.3-33.5
Oscurote, 1953		9,513	35		18,919	8,769,963	31.2
Palacio, 1946		3,440	33	38			
Pelayo			1		50	585,920	
Pradera, 1951		6,430	4	1	1,192	998,059	29.0
Quiamare, 1942		5,900-6,650	14		3,382	6,274,689	42.0
Rincon Largo, 1941		6,500-8,500			438	6,689,356	36.2
San Joaquin, 1939		6,560	34	4	7,648	17,544,505	43.8
San Roque, 1949		8,500	21	4	2,256	12,861,112	51.1
Santa Ana, 1936		8,500	30	5	11,446	24,653,323	35.4
Santa Fe, 1953		11,113-11,573			41	168,081	39.9
Santa Rosa, 1941		8,500	66	3	34,244	33,975,254	44.6
Soto, 1949		9,500	78	26	31,289	54,953,439	34.1-35.4
Tacata, 1946		2,210	1		214	328,309	38.4
Tapuco, 1952		10,000-10,170	14	6	6,055	7,974,411	32.8
Yopales, 1937		4,600	9	17	4,160	11,527,921	25.0
Zeta, 1954		10,700	64	3	35,255	19,949,376	32.5
Total Anzoategui			1,219	663	513,386	1,263,974,162	

*Shut in.

ECUADOR

ECUADOR PRODUCTION

Name of field and discovery year—	Proved acres	Depth (ft.)	No. wells— Flow.	Pump.	Production, bbl.— Daily	Cumulative	Gravity, °A.P.I.
Ancon, 1921	12,844	400-5,000		1,303	6,779	52,432,779	37-38
Carolina Santa Paula, 1934	495	700-3,000		64	1,063	2,044,990	27-28
Cautivo-Tigre, 1920	1,954	500-3,500		168	1,537	7,945,611	37-38
Concepcion, 1931		4,000		27	145	1,360,151	37-38
Petropolis and San Marcos, 1937	248			23	147	1,237,189	29-30
Total Ecuador				1,585	9,671	65,020,720	

● Crude production comes from fields on Santa Elena Peninsula. The 9,670-bbl. daily output this year was slightly behind the 1955 average of 9,800 bbl. daily. Anglo-Ecuadorian Oilfields, Ltd., jointly owned by Lobitos Oilfields, Ltd., and South American Gold & Platinum Co., is the

EASTERN VENEZUELA PRODUCTION (Continued)

Federal Territory of Amacuro

Name of field and discovery year—	Proved acres	Depth (ft.)	No. wells— Flow.	Pump.	Production, bbl.— Daily	Cumulative	Gravity, °A.P.I.
Pedernales, 1933		1,571	20		10,698	37,863,158	21.3
Tucupita, 1945		5,606	37		3,122	25,239,799	16.5-16.9
Total Amacuro			57		13,820	63,102,957	
State of Guarico							
Aragua, 1950		7,519-8,822	13	4	1,319	1,792,019	52.6
Belen, 1954		4,648	*1		6	2,820	47.3
Bella Vista, 1952		4,700	11	33	2,458	3,191,092	26.8
Dakoa, 1951		3,500-5,700	6		326	263,282	39.0
Grico, 1946		400-4,870	1		109	128,219	28.8
Las Mercedes, 1942		4,160-4,500	100	53	23,616	62,528,739	32.5
Piraqua, 1949		3,448	2	1			36.8
Punzon, 1946		4,400	2		225	333,452	33.5
Ruiz, 1949		4,450	25	31	7,066	18,110,893	31.8
Saban, 1947		2,600	21	26	4,342	9,528,521	36.6
Taman, 1949		5,200	1	13	1,629	10,264,054	38.7
Tucupido, 1947		2,800-5,600	9	14	2,270	13,660,235	39.2
Valle			4		38	6,900	35.2
Total Guarico			196	175	43,404	119,147,226	

*Shut in.

State of Monagas							
Aguasay, 1955		4,000	†2		214	38,877	29.7
Coporo, 1954		5,746	*2				35.1
Jusepin, 1938		3,000-5,300	19	32	4,266	158,698,223	36.8
Manresa, 1954		2,524-2,615	1	2	898	188,848	16.4
Mata Grande, 1946		4,700	11	33	2,458	5,323,814	26.8
Mulata, 1941		3,500-6,600	38	92	7,532	80,791,158	36.8
Muri, 1942		4,500	4	26	708	14,666,999	27.0
Oritupano, 1954		7,675	1	3	491	279,622	27.1
Orocual, 1933		2,954			2,638	1,056,016	21.9
Quiriquire, 1928		6,500-8,000		491	65,055	470,680,589	32.8
Santa Barbara, 1941		5,000-6,500	85	112	23,585	94,611,142	32.2-34.5
Tacat, 1953		1,830-3,668		21	2,053	767,370	19.8
Temblador, 1936		3,500-4,500	63	1	8,188	51,051,607	20.0-21.3
Travieso, 1944		4,000		9	166	1,335,742	26.6
Total Monagas			226	822	118,252	879,490,007	

*Shut in. †Third well in this field completed as 1,300-bbl. discovery in October.

Total East. Venezuela	370,000	1,698	1,660	688,862	2,325,714,352	
Total Venezuela	790,000	2,727	6,772	2,481,757	9,078,003,150	

Petroleum Co., 48,000 bbl. daily; Venezuelan Atlantic Refining Co., 19,500 bbl. daily; Venezuelan Petroleum Co. (Sinclair), 29,600 bbl. daily; Phillips Petroleum Co., 10,600 bbl. daily; Pantepec Oil Co., C.A., 5,500 bbl. daily; and Talon Petroleum, C.A., 2,500 bbl. daily.

Intensive exploration is under way in eastern Venezuela, which accounts for about two-fifths of the country's output. Venezuelan Petroleum made one of the year's best discoveries in a 14,221-ft. test in western Monagas. Several potential producing sands were encountered. Tests on two of the zones indicated the well was at least a 1,300-bbl.-daily producer.

Phillips acquired additional production this year in eastern Venezuela when it took over the operations of Pantepec in November. Phillips obtained concessions over 32,000 acres in El Roble and Mulata fields. It will pay $4,900,000 in five installments plus royalty and overrides.

Venezuela's third producing region will open late in 1958 with the completion of a 211-mile, 20-in. crude line from the Barinas-Apure basin to the Caribbean Coast. Initial capacity of the line will be 100,000 bbl. daily. It is being built jointly by Socony Mobil and Sinclair, who hope to start operations with a throughput of 40,000 to 60,000 bbl. daily. The companies currently have shut in production in Barinas, San Silvestre, and Silvan fields.

Dredging is continuing on the Lake Maracaibo ship channel, opened this year to tankers of the 18,000-ton, T-2 class. Eventually, the channel will handle much larger ships. The channel was planned to speed crude deliveries and simplify handling. Key to the project was a 2¼-mile breakwater which prevents refilling with silt.

In connection with the channel, Creole is building a $17,000,000 terminal at La Salina. It will have tankage for 3,144,000 bbl. of crude, and berth tankers up to 60,000 tons.

Among the other projects to facilitate crude handling was Shell's second underwater "Lapline" in Lake Maracaibo, which went into operation this year. The 20½-mile, 20-in. line doubled the 100,000-bbl. capacity line laid in 1955. The new line merges with the present 28-mile, 24-in. overland line at La Ensenada.

ECUADOR REFINING

Company—Refinery location—	Bbl. per stream day— Crude dist.	Cracking	Other processing
Anglo-Equadorian Oilfields, Ltd.:			
Lalibertad, Santa Elena	5,000		
Manabi Exploration Co., Inc.:			
Santa Elena	625		
Total	5,625		

largest producer with 320 sq. miles under concession. It handles 84 per cent of total production. This includes 6,780 bbl. daily of its own, plus 1,200 bbl. daily from two subsidiaries, Petropolis Oil Co. and Carolina Oil Co., and 150 bbl. daily from a local company for which it is operating contractor, Concepcion Ecuadorian Oilfields.

Manabi Exploration Co., Inc., controlled by Pantepec Oil Co., C.A., produces the remaining 1,500 bbl. daily.

Ecuadorian refining capacity consists of a 5,000-bbl.-daily Anglo-Ecuadorian plant at La Libertad, and Manabi's 625-bbl.-daily topping plant at Santa Elena. Anglo-Ecuadorian has agreed to build a new plant by mid-1958 which will meet domestic demand.

Some field work was being carried on in the coastal area by a Standard Oil Co. of California subsidiary.

COLOMBIA

COLOMBIA PRODUCTION

Name of field and discovery year—	Proved acres	Depth (ft.)	No. wells— Flow.	Pump.	Production, bbl.— Daily	Cumulative	Gravity, °A.P.I.
Buturama, 1953		6,567	3		496	89,817	36-38
Caipal, 1955*	90	6,000				2,236	17.0
Cantagallo, 1943		4,525-7,358	8		2,362	4,706,064	20.6
Carbonera, 1939		800-1,999		2	50	273,309	20.7
Casabe, 1941		2,140-5,660	2	374	34,619	106,919,227	21.1
Colorado, 1925		2,800-5,600	5	8	370	841,823	30-40
El Difícil, 1943		5,590-5,800	16		1,498	6,204,157	41.5
Galan, 1945		3,000-4,000	14	22	2,910	1,552,712	19-20
Infantas, 1918		600-3,500	1	319	7,638	171,811,942	24-32
La Cira, 1925		900-4,200	1	741	18,546	318,793,000	24-30
Ortega, 1951	880	5,800		3	1,100	904,511	28.0
Petrolea (North), 1933	9,402	760-1,220	11	11	554	32,301,384	45.0
Petrolea (South), 1937†		1,000				42,178	37.0
Rio de Oro:							
Catatumbo & Mito-Juan Zones, 1937	759	1,200-1,500	4	7	530	758,412	46.6
Uribante Zone, 1937	570	7,100-7,400	4	1	1,966	1,540,338	46.6
Basement Complex, 1955		7,900	1		450	129,706	46.6
Sardinata:							
Catatumbo Zone, 1941-1955	642	4,460		5	840	465,047	36.0
Uribante Zone, 1950	1,120	8,700-9,700	6		1,175	1,791,668	48.7
Tetuan, 1949	233	2,600	1		100	196,166	23.0
Tibu:							
Carbonera Zone, 1954		786		4	12	22,170	22.4
Barco Zone, 1940	21,802	4,500-4,600	23	176	14,383	62,969,946	31.7
Catatumbo Zone, 1940	1,350	4,900-5,000	1	14	1,019	1,063,358	31.7
Uribante Zone, 1942	14,449	8,650-9,700	27	4	5,173	15,693,003	46.0
Totumal, 1951		8,872	3		291	52,695	25.8-26.3
Velasquez, 1945	4,620	7,000	45	17	26,000	12,766,737	24.5
Yariqui, 1954		7,190-8,028	3		4,048	1,094,691	20.3
Total			179	1,708	126,130	742,986,297	

*One-well field shut in with 50 bbl. daily potential. †Considered depleted and abandoned.

ARGENTINA

ARGENTINA PRODUCTION*

Name of field and discovery year—	Proved acres	Depth (ft.)	No. wells— Flow.	Pump.	Production, bbl.— Daily	Cumulative	Gravity, °A.P.I.
Calefa							
Comodoro Rivadavia, 1925		3,400-6,900	1	433	8,177	91,690,244	24.2
Mendoza							
Neuquen							
Salta							
Total			1	433	*79,800	610,153,500	

*Estimated.

● The Argentine oil industry seemed to be marking time this year, its future dependent on how soon and how much financing could be arranged for large-scale expansion programs.

The possibility that foreign companies would help develop the industry through new concessions fell flat with the Peron Government in 1955. As an alternative plan for bringing much-needed foreign money into the country, the Aramburu Government this year sought to finance its own $250,000,000 expansion program through construction loans from foreign banks and equipment manufacturers. The aim of this program was to double production within 3 years, raising output to about 170,000 bbl. daily.

In line with this program, the state oil agency, Yacimientos Petroliferos Fiscales (Y.P.F.), was placed on an autonomous status and given the job of negotiating for equipment and know-how on credit terms. The chief

COLOMBIA REFINING

Company—Refinery location—	Bbl. per stream day— Crude dist.	Cracking	Other processing
Colombian Pet. Company—Tibu	2,000		
Emprisa Colombiana de Petroleos—Barrancabermeja	36,500	19,000 FCC 16,500 Vis	A-1,400, L-450, Alky-1,255
Texas Petroleum Co.—Guamo	1,200		
International Petroleum (Colombia), Ltd.—Cartagena	(1)		
Total	39,700	35,500	

(1) A 26,500-bbl. daily refinery under construction to include 25,000-bbl. total-feed fluid cat cracker, vacuum distillation, and cat poly units.

• Two new companies entered Colombia this year.

Forest Oil Corp., Bradford, Pa., began a pilot water-flood project in two old fields in De Mares concession under a contract with the government company, Empresa Colombiana de Petroles. The concession reverted to the government in 1951. If a test five-spot pattern works out, the project will extend to the 13,000 acres of La Circa and 7,000 acres of Infantas fields.

Cities Service Co. began work under a 1955 agreement with Empressa Colombiana for an intensive exploratory program on 2,200,000 acres of El Carare. Cities Service will pay 75 per cent of the costs in return for 75 per cent of any production, less royalty.

These programs reflect the government's desire to develop more crude production. The government also said it is seeking to speed the conversion of applications on vast acreage to concession contracts.

Production comes from two regions in the country, Magdalena basin in Northwest-Central Colombia, and Maracaibo basin, across the Venezuelan border. The leading producer is Concesionaria de Petroleo Shell-Condor, S.A., owned 60 per cent by Royal Dutch-Shell and 40 per cent by Canadian Eagle Oil Co., Ltd. Casabe is the best of its four fields, which produce around 42,500 bbl. daily.

Empresa Colombiana produces about 29,500 bbl. daily from four fields, the best of which is La Circa. One wildcat was abandoned earlier this year and 8 out of 10 development wells were completed as producers. Texas Petroleum Co. produces 27,200 bbl. daily, including 26,000 bbl. daily from Velasquez field. A wildcat and 13 development wells were all completed as oil producers earlier this year. Two more wildcats and 25 more development wells were to be drilled by now.

Colombian Petroleum Co., owned jointly by Socony Mobil Oil Co., Inc., and The Texas Co., averages about 26,200 bbl. daily. Of its 10 fields, the best 2 were Barco and Uribante, in Tibu. Fourteen out of 20 development wells were completed as producers earlier in the year. The program for the current half was 22 development and 5 wildcat wells.

International Petroleum (Colombia), Ltd. (Intercol), a Standard Oil Co. (N. J.) subsidiary, produces about 800 bbl. daily from Buturama and Totumal fields.

ARGENTINA REFINING

Company—Refinery location—	Bbl. per stream day— Crude dist.	Cracking	Other processing
Cia. Condor—Avellaneda	900		
Cia. La Isura, S.A.—Bahia Blanca	2,000		
Diadema Argentina, S.A. de Petroleo—Buenos Aires*	21,000	9,000 TC	TR-3,000
Esso Refinadora de Petroleo:			
Bahia Blanca	5,500	1,000 TC	
Campana	25,000	11,000 TC	
Dadin (Plaza Huincul)	500		
Manuel Elordi	1,300		
Lottero y Papini-Avellaneda Ramon Gorleri—Quilmes	1,500		
Yacimientos Petroliferos Fiscales:			
Avellaneda	6,000	2,500 TC	
La Plata	[1]95,000	18,400 FCC 7,000 TC	
Lujan de Cuyo	[2]11,300	9,000 TC	
Plaza Huincul	1,300		
Comodoro Rivadavia	5,500	2,000 TC	
Salta	2,500	1,300 TC	
San Lorenzo	16,000	6,200 TC	
Total	[3]195,900	66,400	

*Figures on calendar-day basis.

(1) Additional 28,000 bbl. crude capacity planned for completion in 1960. (2) Additional 12,500 bbl. crude capacity being added for completion in 1958. (3) Argentine Government is now seeking $50,000,000 credit to be used in refinery expansion program.

items Y.P.F. was seeking were $75,000,000 in drilling equipment, $95,000,000 in pipelines, and $50,000,000 in refining facilities. But even with this, oil men are openly skeptical of the idea that the country can become self-sufficient in petroleum by 1959.

Meanwhile, Y.P.F. crude production remained at about the same level as last year, around 70,000 bbl. daily. The agency had 56 rigs running in 1956. Last year, an equal amount of equipment completed 48 wildcats and 173 development wells, of which 162 were oil, 11 natural gas, and 48 dry holes.

Virtually all remaining crude is produced by subsidiaries of two majors and two domestic firms. Output is gradually declining because of a lack of new acreage. Diadema Argentina (Royal Dutch-Shell) produces about 8,300 bbl. daily; Esso Productora de Petroleo S. A., 900 bbl. daily; "Astra" Cia. Argentina de Petroleo S.A., 2,700 bbl. daily; and Petroquimica, 1,600 bbl. daily.

CHILE

CHILE PRODUCTION

Name of field and discovery year—	Proved acres	Depth (ft.)	No. wells— Flow.	Pump.	Production, bbl.— Daily	Cumulative	Gravity, °A.P.I.
Calafate, 1955			1		40	14,300	
Chanarcillo, 1950		7,600	3		405	478,947	46
Chanarcillo Sur, 1953		7,500	1		120	102,727	46
Chillan, 1953		7,600	11		747	543,747	41
Cullen, 1954		6,000	11		491	255,747	42
Delgado, 1952*		7,600				1,567	39
Espora, 1949*		7,500				4,489	46
Flamenco, 1954		6,500	6		43	23,551	42
Manantiales, 1945		7,500	16	3	400	1,250,789	42
Manantiales Sur, 1955		7,800	1		200		
Manzano, 1953*		4,000-5,000					
Primavera, 1954*		7,600					
Sombrero, 1950		7,500	17		2,510	3,297,106	42
Sombrero Norte, 1954		7,250	1		11	1,987	42
Victoria Este, 1954		7,500	5		305	273,983	46
Victoria Norte, 1950		7,600	1		186	324,532	42
Victoria Sur, 1950		7,500	15		970	1,864,963	42
Total			89	3	6,428	8,438,435	

*July production in Chile topped 10,200 bbl. daily, considerably higher than this average daily figure for the first 6 months. The increase can be attributed to increased production from these fields and the following one-well fields not listed above: Agostura Golondrina, Punta Baja, Sara, Side, and Verientes.

PERU

PERU PRODUCTION

Name of field and discovery year—	Proved acres	Depth (ft.)	No. wells— Flow.	Pump.	Production, bbl.— Daily	Cumulative	Gravity, °A.P.I.
Agua Caliente, 1938		1,100	6	10	900	174,230	43.7
Cope, 1938		650		6	4	165,859	34.0
El Alto, 1910		2,000	13	680	5,920	47,570,323	37.7
La Brea Parinas, 1888		3,000	203	1,699	28,050	372,739,404	36.3
Lobitos, 1902		4,500	79	219	10,320	51,256,607	37.5
Area of joint development†		3,000	27	14	††1,516	3,077,159	44.5
Area "A"†		3,000	21	35	††1,528	1,257,602	37.8
Los Organos, 1946		1,800	3	111	1,455	3,175,823	34.7
Zorritos, 1863		2,000		23	34	3,641,832	36.8
Sector Peru, 1953		3,500		5	127	39,008	31.0
Concesion Patria, 1943		2,000		105	1,714	585,979	42.0
Tablazo, 1955		6,000	2		400	42,959	33.0
Mirador, 1955		5,000	9		224	112,073	38.0
Total			363	2,907	52,192	483,838,858	

*Includes gas lift and pumping wells. †These two areas are extensions to the Lobitos producing area. They are being developed by International Petroleum Co. on a 50-50 basis for Cie. Petrolera Lobitos. These figures represent I.P.C.'s share of production. The other half is included in Lobitos.

BRAZIL

• Petroleo Brasileiro (Petrobras), organized in 1953 by the government to handle exploration, development, refining, and transportation of domestic oil, made progress in all departments this year. But because of limited available finances and rapidly growing consumption, Petrobras continues to have a tough job ahead in making Brazil self-sustaining for crude and refined products.

BRAZIL PRODUCTION

Name of field and discovery year—	Proved acres	Depth (ft.)	No. wells— Flow.	Pump.	Production, bbl.— Daily	Cumulative	Gravity, °A.P.I.
Agua Grande					(*)	197,548	41.0
Catu sand, 1953	50	600					
"A" zone, 1950	200	3,400					40.0
Sergi sand, 1952	832	3,400					42.0
Aratu, 1942	60	1,500	3		(†)	57,222	
Candeias, 1941	1,505	2,500-3,700	57		3,000	5,292,475	32.0
Dom Joao, 1947	4,893	800	‡44		2,000	1,502,021	22.0
Itaparica:							
"A" zone, 1943	408	2,000	12		400	309,318	36.0
Sergi sand, 1942	235	2,500					35.0
Lobato, 1939	22	1,900			($)	83,587	32.0
Mata de Sao Joao:							
Victoria sand, 1952	160	1,350			(¶)	820	
"A" zone, 1951	40	3,300					40.0
Sergi sand, 1953	160	3,300					37.0

CHILE REFINING

Company—Refinery location—	Bbl. per stream day: Crude dist.	Cracking	Other processing
Empresa Nacional del Petroleo—Concon	†20,000	4,960 Vis 4,520 TC	TR-3,970
Total	20,000	9,480	

(1) Planned expansion includes addition of 24,000-bbl. daily crude unit, 9,600-bbl. daily vacuum-distillation unit, 11,000-bbl. daily fluid cat cracker, 6,000-bbl. daily catalytic reformer, and 2,000-bbl. daily alkylation unit.

• Chile is still closed to foreign oil companies, but the president sent a bill to congress late this year which would open the country. It is still questionable whether congress will pass the bill.

The government company, Empresa Nacional del Petroleo (ENAP), made progress in developing the industry. Crude output the first 7 months of 1956 averaged 9,100 bbl. daily, compared with the yearly average of 7,100 bbl. daily in 1955, and 4,800 bbl. daily in 1954. Output comes from Lower Cretaceous in Chile's southern basin. All fields except one are on the island of Tierra del Fuego. Five rigs were running early this year, the same number which completed 58 wells in 1955, of which 25 found oil and 8 natural gas. Twenty-five were dry holes.

ENAP operates the country's only refinery, a 20,000-bbl.-daily plant at Concon, 12 miles south of Valparaiso.

The government company has carried out all exploration and production activities in the country since 1928, but if the new bill goes through, it would change that. Not only would private domestic companies find the door open in Chile, but foreign private operators could move in as well.

The president's bill would permit each applicant to acquire 10 exploration concessions of 125,000 acres in the northern part of the country. The government would take a 50 per cent cut of all production profits.

PERU REFINING

Company—Refinery location—	Bbl. per stream day: Crude dist.	Cracking	Other processing
Cia. de Petroleo Ganzo Azul, Ltd.—Agua Caliente	1,000		
Empresa Petrolera Fiscal—Iquitos	1,200		
International Pet. Co., Ltd.—Talara	44,000	15,200 TC	L-600, A-1,420, V-2,800
Total	46,200	15,200	

• Peru is characterized by increasing work on millions of untried acres on one hand, and by stable output from old, intensely developed fields on the other.

Exploration play is centering in the Montana region, east of the Andes. The area is comparatively inaccessible and difficult to work in. Majors, independents, and local Peruvian companies have applied for, or received, concessions on more than 35,000,000 acres. Interest has increasingly shifted to this region with continued disappointing results in the Sechura Desert.

Agua Caliente, Peru's only field east of the Andies, stepped up output to 2,000 bbl. daily late this year upon the opening of Manaus refinery on the Amazon River in Brazil. A new 46-mile, 4-in. pipeline carries crude to Pucallpa, a port on the Ucayali River, a tributary of the Amazon. From Pucallpa, crude is barged to the Peruvian Government's refinery at Iquitos, 600 miles downstream, or 1,800 miles to Manaus. The field and line are owned by Ganso Azul Cia. de Petroleo, owned 80 per cent by Texas Gulf Producing Co. and 10 per cent each by Kendall Refining Co., Bradford, Pa., and Bay Refining Corp., Bay City, Mich.

Development work is continuing in Peru's coastal fields north of Sechura, which produce the bulk of the country's crude. International Petroleum Co., Ltd., a Standard Oil Co. (N. J.), affiliate, is the largest producer and the operator of LaBrea-Parinas, the best field.

BRAZIL PRODUCTION (Continued)

Name of field and discovery year—	Proved acres	Depth (ft.)	No. wells: Flow.	Pump.	Production, bbl.: Daily	Cumulative	Gravity, °A.P.I.
Nova Olinda, 1955		8,900			(††)		
Paramirim V., 1950	60	3,700	1	1	60	130,527	34.0
Pomuca Central:							
"A" zone, 1953	300	4,600			(‡)		41.0
Sergi sand, 1953	300	4,900					42.0
Rio da Serra, 1950	200	600			(**)	125	30.0
Total			117	1	5,460	7,573,643	

*Test production only, 29-well field shut in for lack of pipeline. †Gas field. ‡Ninety wells shut in for lack of pipeline or pressure maintenance. §Abandoned. ¶Twenty-one-well field shut in for lack of pipeline. ‖Six-well field shut in for lack of pipeline. **Twelve-well field shut in for lack of pipeline. ††Discovery not yet on production.

Development drilling of known fields in the State of Bahia is being pushed. Twenty-nine development wells, of which 24 were producers, were completed the first half. Thirty more were scheduled by the end of the year. A large share of production was shut in most of 1956. But with the completion of field-gathering and shipping facilities, output late this year more than tripled, reaching 20,000 bbl. daily.

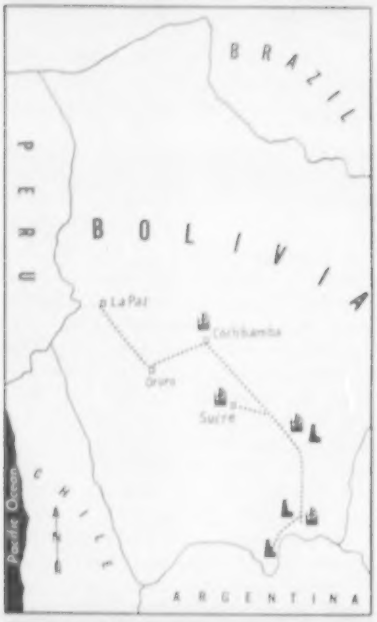
(Brazil continued on next page)

BRAZIL REFINING

Company—Refinery location—	Bbl. per stream day: Crude dist.	Cracking	Other processing
Cia. de Petroleo da Amazonia, S.A.: Manaus	5,000	2,500	
Destilaria Rio Grandense de Petroleo: Uruguaiana	300		
Industrias Mafarazzo de Energia: Sao Paulo	500		
"Ipiranga" S.A., Rio Grande do Sul: Rio Grande	7,000	2,000 TC	A-60[1]
Refineria de Manguinhos, S.A.: Rio de Janeiro	10,000	7,000 Vis	
Refineria Uniao, S.A.: Capuava	20,000	10,000 FCC	

Exploration in other areas chiefly was centered in the Amazon Basin, which offers the best long-range prospects. Three wildcat wells were abandoned as dry holes the first half. Eight more were scheduled during

BOLIVIA



BOLIVIAN PRODUCTION

Name of field and discovery year—	Proved acres	Depth (ft.)	No. wells: Flow.	Pump.	Production, bbl.: Daily	Cumulative	Gravity, °A.P.I.
Bermejo, 1924		4,000	12		431	1,425,020	25.0
Camiri, 1927		4,500	40	*7	8,108	9,497,125	54 7
Guairuy, 1947		2,500	2		†532	534,342	55-59
Sanandita, 1926		2,300	2	11	101	2,012,020	42.0
Toro, 1955		2,980	1		†350	182,700	21.0
Total			57	18	9,522	13,651,207	

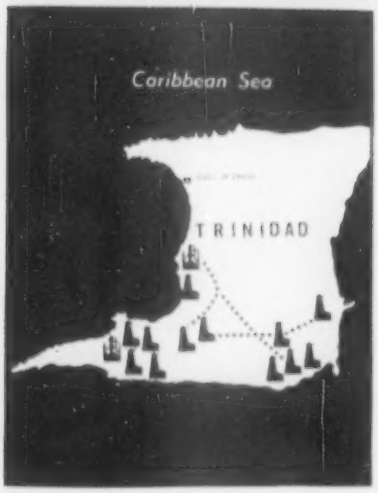
*Another 10 wells are shut in as reserve productive capacity. †Estimated.

• Exploration in Bolivia went on a new footing this year as the country opened acreage to foreign companies on a concession basis for the first time since oil properties were expropriated in 1937.

Gulf Oil Co. was the first company to enter the country under the new oil code, signed in October 1955 by President Victor Pas Estenssoro. The company obtained exploration rights on 33,750 acres under a special agreement with the government on lands in the southeastern part of the country. This area is reserved for the state agency, Yacimientos Petroliferos Fiscales Bolivianos. Gulf also acquired another 4,000,000 acres in outright concessions in other areas of the country, which had been thrown open for outside development.

In return for 4-year exploration

TRINIDAD



TRINIDAD PRODUCTION*

Name of field and discovery year—	Proved acres	Depth (ft.)	No. wells: Flow.	Pump.	Production, bbl.: Daily	Cumulative	Gravity, °A.P.I.
Brighton-Vessigny, 1908		700-4,600					16-38
Forest Reserve-Apex-San Francique, 1913		1,000-2,800		16	174	5,229,314	24.5
Guayaguayare, 1902		500-6,000					15-49
Kern-Parrylands-Cruse, 1913		2,000-4,000					13-30
Palo Seco-Los Bajos, 1926		460-6,400					16-33
Penoil-Barrackpore, 1918		1,300-9,600	31	111	6,645	30,322,148	17.7-35
Point Fortin-Point Ligoure, 1908		1,000-7,800	113	252	8,806	80,080,451	20-33
Quarry-Coora-Quinam-Morne-Diablo, 1936		280-6,480					16-30
Maruga, 1953							11-30
Ortoire, 1952		1,400-7,200	28	11	4,246	1,859,404	29-41
New Dome, 1948		1,000-3,200		10	219	2,548,609	
Oropouche, 1954		2,000-2,600					28-29
Total			782	†2,055	78,478	540,844,809	

*Individual field data represent Shell Trinidad, Ltd., operations only. Totals are for all Trinidad. †Includes gas-air lift, pumping, plunger lift, etc.

BRAZIL REFINING (Continued)

Company—Refinery location—	Bbl. per stream day— Crude dist.	Cracking	Other processing
Petrobras, S.A.:			
Mataripe	[2]15,000	6,000 TC [2]7,200 FCC	
Cubatao	50,000	18,000 TC	
(Fabrica de Asfalto):			
Cubatao	3,500		
Rio de Janeiro	[3]		
Total	111,300	52,700	

(1) Tons daily. (2) Refinery throughput being increased to 37,000 bbl. daily, including another 4,800-bbl. daily cat cracking capacity. (3) New 90,000-bbl. daily refinery planned.

the last 6 months. Most of the exploration drilling was done around Nova Olinda, a 1955 discovery.

Petrobras refineries account for 61 per cent of the country's 111,300-bbl. daily capacity. Two major projects are scheduled. A new 90,000-bbl.-daily plant is planned for Rio de Janeiro, and the 15,000-bbl.-daily Mataripe refinery is being increased to 37,000 bbl. daily.

A new 5,000-bbl.-daily refinery went on stream at Manaus late this year. It is owned by Cia. de Petroleo da Amazonia, S.A., a private company permitted to operate the plant because it was under construction at the time Petrobras was created. Venezuelan crude was used for initial runs. But the main source of crude is expected to be Ganso Azul field, located on the eastern side of the Andes Mountains in Peru.

BOLIVIA REFINING

Company—Refinery location—	Bbl. per stream day— Crude dist.	Cracking	Other processing
Yacimientos Petroliferos Fiscales Bolivianos:			
Camiri	1,450		
Cochabamba	5,850		[1]PL-1,500, [2]L-200
Sanandita	410		
Sucre	4,000		
Total	11,710		

(1) Planned. (2) Under construction.

rights, and 40-year exploitation rights on 1,125,000 acres within the exploration area, Gulf will pay 11 per cent royalty on all production plus a 19 per cent development tax. The company also will furnish $5,000,000 to help finance a 201-mile pipeline from Sicasica to Arica, on the Chilean Coast.

At least two other companies are interested in the country. Shell Prospecting Co., Ltd., has applied for a large exploration concession. Richfield Oil Corp. late this year was taking preliminary steps for filing a bid.

Y.P.F.B. now handles all crude production. Output in Camiri and fields further south passed 9,000 bbl. daily in recent months. This level of production is higher than domestic needs and permits some exports to neighboring countries. Crude for local consumption is shipped by pipeline to Sucre and Cochabamba refineries. A 6-in. products line to Oruro and La Paz is under construction. Most exports go to Argentina, via a 156-mile, 6-in. line to the Argentine border.

The only foreign firm in the country before the new code was Glenn McCarthy, Inc., of Bolivia. The Houston independent signed a concession contract in 1953 on 970,000 acres. Both oil and gas discoveries have been made on the acreage but wells are shut in at present. This year McCarthy signed contracts to supply natural gas to two Chilean mining companies. The deal is contingent on the availability of gas supplies and on the success of a pipeline project.

TRINIDAD REFINING

Company—Refinery location—	Bbl. per stream day— Crude dist.	Cracking	Other processing
Brighton Terminal, Ltd.—Brighton	4,000		
Trinidad Oil Co., Ltd.—Pointe-a-Pierre	[1]100,000	30,000 Vis 25,000 FCC	V-55,000, TR-8,500, Alky-1,800, Poly-4,700
Shell Trinidad, Ltd.—Point Fortin	33,000		V-7,000, A-6,000
Total	137,000	55,000	

(1) An 8,000-bbl. Platformer and a 10,000-bbl. catalytic hydrogenation unit being added.

● One Trinidad oil company was sold this year and the sale of a second is expected within the near future.

The Texas Co. purchased Trinidad Oil Co., Ltd., for $176,000,000 in cash. The transfer was completed after the British and Trinidad Governments both consented. Approval followed a storm of protest in the British Parliament in which there were objections to an American company acquiring any British oil interests. The purchase gave The Texas Co. 27,000-bbl.-daily output in Trinidad on 138,000 acres and an 80,000-bbl.-daily refinery at Pointe-a-Pierre. There also was considerable offshore acreage involved. Trinidad Oil in addition has marketing interests in the Caribbean, United Kingdom, and Canada, where it also is a refiner. It markets in these areas under the trade name "Regent."

Colorado Oil & Gas Corp. offered to buy control of another local company, Trinidad Petroleum Development Co. But the sale was blocked by the British Government because Colorado Oil proposed a stock exchange rather than a purchase in dollars, which Britain needs badly. British Petroleum Co., Ltd., controlled by the government, then offered to buy the

(Trinidad continued on next page)

company itself. It proposed a $26,800,000 cash-and-stock offer which late this year awaited approval by stockholders. British Petroleum would get Trinidad Petroleum's 10,000-bbl.-daily output on 74,000 acres along with offshore concessions.

Crude production in Trinidad is rising steadily but slowly. Output passed the 80,000-bbl.-daily mark for the first time in September. The gains have been due to intensive development drilling. Twenty-seven rigs were operating on the island, and in the first 6 months 113 oil wells were completed. There were 12 dry holes.

The best prospects for developing substantial additional reserves lie in the offshore areas, especially in the Gulf of Paria. Among the best wells on the island are directional tests

MEXICO

MEXICO PRODUCTION

Name of field and discovery year—	Proved acres	Depth (ft.)	No. wells Flow.	No. wells Pump.	Production, bbl. Daily	Production, bbl. Cumulative	Gravity, °A.P.I.
Northeastern District, 1948		5,668			3,348	7,839,705	49
Tampico, Norte, 1901		1,150			19,078	859,685,114	12
Tampico, Sur, 1908		2,200			16,210	1,146,518,343	20
Nueva Faja de Oro (New Golden Lane), 1952		4,000			62,245	59,946,628	19
Poza Rica, 1930		6,900			111,398	656,374,003	35
Central Veracruz, 1953		3,600			13,046	6,052,180	15
Isthmus and Tabasco, 1911		3,000			21,430	312,316,092	35
Total					246,755	2,988,785,437	

● Approval of a plan to send Mexican natural gas to the United States was one of the highlights of the Mexican industry this year.

Under the arrangement approved by the Federal Power Commission, Petroleo Mexicanos (Pemex) will sell 100,000,000 to 200,000,000 cu. ft. of gas daily over a 20-year period to Texas Eastern Transmission Corp. The gas will come from fields in northwestern Mexico, where available supplies are increasing steadily. Texas Eastern will build a 422-mile, 30-in. line from the Mexican border to Beaumont, Tex., and a 45-mile extension of a 24-in. which will take the gas into the company's present system near Provident City, Tex.

Another high point of the year was the opening of a 25,000-bbl.-daily products pipeline across the Isthmus

CUBA . . . AND CARIBBEAN AREAS

CUBA PRODUCTION

Name of field and discovery year—	Proved acres	Depth (ft.)	No. wells Flow.	No. wells Pump.	Production, bbl. Daily	Production, bbl. Cumulative	Gravity, °A.P.I.
Bacuranao (Old), 1916	2,000	700					
Bacuranao (New), 1954	150	1,100	2	7	300	70,000	28.0
Jarahueca, 1943	300	1,250		7	155	880,000	38.0
Jatibonico, 1954	350	1,500		30	1,200	800,000	15.0
Motembo, 1885	400	1,000		1	*20	2,250,000	62.0
Santa Maria, 1955	200	3,000		6	38	8,000	28.0
Total			2	51	1,714	4,008,000	

*Distillate field.

● Exploration had the spotlight in Cuba in 1956, but even more money probably was being invested in refinery expansion.

Two new refineries are being built on Havana Bay. Cie. Petrolea Shell de Cuba expects to have a 25,000-bbl.-daily plant on stream late this year. Esso Standard Oil Co., S.A., is enlarging its Belot refinery from 8,500 bbl. daily to 35,000 bbl. daily. It will be completed late in 1957. On the opposite end of the island, The Texas Co. expects to complete a 20,000-bbl.-daily refinery early next year at Santiago de Cuba.

Shallow drilling operations were carried on in several areas throughout the island during the year. The most significant well was 1 Consolidated Cuban. It was drilled in Cruz Verde field, near the old Bacuranao production in Havana Province. The test flowed at better than 520 bbl. daily for over 2 months. In November output had declined to 200 bbl. daily.

At least 35 companies are actively engaged in exploration including a dozen local firms. The major with the biggest exploration budget is Stanolind Oil & Gas Co., a subsidiary of Standard Oil Co. (Ind.). It plans to spend $10,000,000 in a 5-year program which has 4 more years to go.

Among the other more active companies this year were: Sibony Development & Exploration Co. (Crescent

drilled under the gulf from onshore sites by Trinidad Northern Areas, owned jointly by British Petroleum, Royal Dutch-Shell, and Trinidad Oil. Nine of these producers currently are making 200 bbl. daily. T.N.A.'s 1 Soldado, bottomed last year at 7,500 ft. from a platform several miles out in the gulf, later tested at 450 bbl. daily from 4,400-4,800 ft. It produces 34° A.P.I. gravity crude. The discovery and a deviated well completed late this year are shut in. A third well is drilling.

The Trinidad Government this year granted a depletion allowance on offshore production, because of the high costs involved. Along with the gulf on the western side of the island, most of the southern and eastern offshore areas are under license.

MEXICO REFINING

Company—Refinery location—	Bbl. per stream day: Crude dist.	Cracking	Other processing
18 de Marzo—Atzcapotzalco	100,000	(1)	TR-14,500, Alky-1,200 [2]PD-39,000
Ing. Antonio M. Amor—Salamanca	[3]40,000	[4]5,300 TC	V-15,000, PD-9,000, L-2,600, [5]A-100
Madero—Madero	[6]89,000	[7]5,500 TC	[8]V-18,000, PD-11,500, A-3,200
Arbol Grande—Arbol Grande	40,000		A-750
Mata Redonda—Villa Cuauhtemoc	14,000	6,000 TC	
Reynosa—Reynosa	10,000	2,000 TC	
Poza Rica—Poza Rica de Hidalgo	[9]97,000		[10]A-240
Minatitlan—Minatitlan	50,000	10,000 TCC	V-18,000, [11]Poly-800
Total	440,000	28,800	

(1) A 20,000-bbl. fluid cat cracker planned. (2) A 40,000-bbl. vacuum distillation unit planned. (3) A 30,000-bbl. crude distillation unit planned. (4) A 10,000-bbl. cat cracker planned. (5) Tons daily. (6) A 50,000-bbbl. crude-distillation unit planned. (7) A 20,000-bbl. cat cracker planned. (8) A 40,000-bbl. vacuum-distillation unit planned. (9) Includes 90,000-bbl. crude stabilization capacity. (10) Tons daily. (11) An 800-bbl. daily lube plant planned.

of Tehuantepec. Products are shipped from the newly enlarged Minatitlan refinery to Salina Cruz on the Pacific Coast. From there, tankers carry products to ports along the West Coast, replacing imports from the United States. This development went a long way toward ending the loss Pemex has been taking by reselling imports at a loss. This amounted to $21,200,000 last year.

Pemex is continuing a major exploration and development program. Twenty new rigs were purchased at one time this year, one of the largest, if not the biggest single order for drilling equipment yet made in Latin America. This equipment brought total rigs in this country to 145. Several new field discoveries were made during the year, most of them in the old producing State of Veracruz.

Work got under way this year on the first phase of a new industrial center in the State of Tabasco. The project was a 300,000-M.c.f.-daily gas-absorption plant similar to a new plant at Reynosa. The unit and a 22-in. natural-gas line in Minatitlan were expected to be completed this year. These facilities will become a part of "Ciudad Pemex" or Pemex City.

CUBA REFINING

Company—Refinery location—	Bbl. per stream day: Crude dist.	Cracking	Other processing
Esso Standard Oil Co., S.A.—Belot	[1]6,500		
Petrolea Jarahueca—Jarahueca	200		
Refineria Cabaiguan, S.A.—Cabaiguan	2,000	600 TC	
Cia. Petrolera Shell de Cuba—Havana	[2]		
The Texas Co.—Havana	[3]		[3]
Total	8,700	600	

(1) Crude capacity being expanded to 35,000 bbl. daily, completion in 1957. (2) A 25,000-bbl. daily refinery due for completion late 1956. (3) A 20,000-bbl. daily refinery due for completion in 1957, includes 3,300-bbl. cat reformer.

Corp. and Sterling Oil of Oklahoma, Inc.); Kerr-McGee Oil Industries, Inc.; C. J. Simpson Drilling Co., Olean, N. Y.; Cuban American Drilling & Exploration Co. (Tevis Morrow, Los Angeles, Grady Vaughn and Herbert Klein, Dallas, independents); Cuban Kewanee Oil Co.; Empresas Petroleras Jones de Cuba, S. A. (Ted Jones, California independent); and Consolidated Cuban Petroleum Corp.

... Puerto Rico. The island's second refinery went on stream in 1956. It is a 23,520-bbl.-daily plant at Guayanilla Bay, owned by Commonwealth Oil Refining Co., Inc. A major expansion program already is under way. It will include the addition of a 35,280-bbl.-daily crude unit, a 26,800-bbl.-daily vacuum-distillation unit, and a 26,800-bbl.-daily catalytic cracker.

The first refinery, a 13,500-bbl.-daily plant at San Juan, was opened in 1955 by Caribbean Refining Co., owned by a group of several oil companies and other investors.

The refineries, which operate under comparatively favorable tax laws, operate on Latin-American crude. Some products are re-exported to the East Coast of the United States.

A concession over more than 1,000 sq. miles was obtained this year on the island by Frank H. Crerie, Houston banker, and William S. Wallis, Toronto consultant.

... Costa Rica. Union Oil Co. this year made Central America's first discovery. The company's 2 Cocolas, its fifth well on a 3,500,000-acre concession, tested at the rate of 1,000 bbl. daily of 46°-gravity oil from 4,950 ft. The well is 16 miles from the Caribbean Coast, and less than 1 mile from the Panamanian border.

Late this year, the government opened two more areas for exploration, in Puntarenas and Heredia provinces.

... Panama. A discovery a short distance across the border in Costa Rica spurred interest in Panama this year. Union Oil Co., which made the Costa Rican find, planned to start

(Continued on next page)

work on a 350,000-acre concession which adjoins its Costa Rican acreage. Other companies planning immediate work include International Oil & Metals, Seattle; Consolidated American Industries, Inc., New York; Cataract Mining Corp. New York; and Texas American Oil Corp., Midland, Tex.

Two major refinery projects were planned this year. Panama Refining & Petrochemical Co., Inc., headed by John M. Shaheen, New York investor, expects to start work on a 55,000-bbl. daily plant late this year in Colon Province. D. K. Ludwig, sole owner of Panama Refining, Inc., plans a 70,000-bbl.-daily plant.

... British Honduras. British Honduras Gulf Oil Co. discontinued drilling operations late this year after abandoning two wells. The company plans to review the data obtained before starting new wells, and the rig was moved from the country. The 1 Yalbac, 20 miles west of the Guatemalan border, was bottomed at 9,000 ft. The 1 Hillbank was stopped at 6,650 ft. It was 25 miles northeast of the first test.

... Guatemala. The Guatemalan Government this year granted concessions under the new petroleum code approved in July 1955. Twenty-two applicants were approved for concessions in June 1956, and by late November, exploration rights were parceled out on a total of more than 8,500,000 acres.

Interest centered in the northern Province of El Peten, and companies spent months ironing out compromises on overlapping.

Seventeen companies were declared 100 per cent eligible for the acreage they wanted. They were Tidewater Guatemala, Ltd.; Ohio Oil Co. of Guatemala; Sohio Caribbean Co.; Continental Oil Co. of Guatemala; Guatemala Atlantic Corp.; Petroleum Investments (Overseas) Ltd. (Shell); Amerada Petroleum Corp. of Guatemala; Texas Petroleum Co.; Union Oil Co. of California; Esso Standard (Guatemala) Inc.; Sun Production Co.; Central American Oil & Mining Co.; Inversiones Guatemaltecas Americanas S.A.; Cia. Petrolera California, Ltd., (California Standard); Jaime Allan Willard Duran (backed by Huskey Oil Co.); Petroleos Guatemaltecos S.A. (backed by Santa Fe Drilling Co.); and Signal Exploration Co.

Companies declared partially eligible for acreage applied for were Sea-

NETHERLANDS WEST INDIES REFINING

Company—Refinery location—	Bbl. per stream day— Crude dist.	Cracking	Other processing
Lago Oil & Transport Co., Ltd.—Aruba*	440,000	43,000 FCC [1]340,000 Vis	V-20,500, Alky-5,300,
N.V. Curacoosche Pet. Industrie Mij.—Curocao*	210,000	120,000 TC [2]	TR-16,000
Total	650,000	503,000	

*All figures on calendar-day basis.
(1) Includes 50,000-bbl. gas-oil cracking and 16,000-bbl. thermal reforming capacity normally operated for visbreaking. (2) 33,000-bbl. catalytic cracker due on stream second quarter, 1957.

AFRICA

NORTH AFRICA

FRENCH MOROCCO PRODUCTION

Name of field and discovery year—	Proved acres	Depth (ft.)	No. wells— Flow.	Pump.	Production, bbl.— Daily	Cumulative	Gravity, °A.P.I.
Ain Hambra, 1918	295	400		3	4	93,041	36.5
Upper Bled Eddoum, 1952	87	3,950		9	477	469,430	39.0
Lower Bled Eddoum, 1952	94	4,300	7		447	528,165	37.0
Upper Bled Khatara, 1953	106	4,600		10	325	456,950	39.5
Lower Bled Khatara, 1954	17	5,200	3		145	109,320	40.0
Bou Draa, 1955	275	2,800	2	2	159	31,625	39.2
Mersel Kharez, 1951	75	4,300	6		92	525,530	36.7
Oued Beth, 1947	280	3,300	13		83	898,000	35.0
Oued Mellah, 1949	260	1,900	13		93	357,820	28.5
Upper Sidi Fili, 1952	96	3,950	1	3	97	188,470	39.0
Lower Sidi Fili, 1950	296	4,500	11		118	840,100	36.7
Tsel Fat, 1937	12	900		1	4	36,385	38.2
Lower Zrar, 1955	17	5,600	1		70	53,620	35.7
Total			57	28	2,114	4,588,356	

ALGERIA PRODUCTION

Oued Gueterini, 1949	1,900	1,100-1,600	2	43	856	2,240,420	38.9
Total Algeria			2	43	856	2,240,420	

• Exploration play got under way this year on Libya's extensive, untried sedimentary areas. A dozen companies received concessions on a total of 126,745,251 acres in awards completed this year on bids made in 1955. Nine American companies are involved, and their grants alone cover an area equal to 60 per cent of the size of Texas.

The companies obtaining acreage, and parent firms were: D'Arcy Exploration Co. (Africa) Ltd. (British Petroleum Co. Ltd.); Anglo-Saxon Petroleum Co. Ltd. (Royal Dutch-Shell); Cie. Francaise des Petroles; Libyan American Oil Co. (Texas Gulf Producing Co.); Esso Standard, Libya, Inc. (Standard Oil Co., N.J.); the Conorada group, consisting of Amerada Petroleum Corp. of Libya, Continental Oil Co. of Libya, and Oasis Oil Co. (Ohio Oil Co.); a Caltex company; American Overseas Petroleum, Ltd. (The Texas Co. and Standard Oil Co. of California); Bunker Hunt, Dallas; and Mobil Oil Co. of Canada, Ltd. (Socony Mobil Oil Co., Inc).

A discovery a short distance across the frontier in Algeria caused a belated rush for an open block of acreage along the border in Fezzan Province. The award was made to C.F.P.

Libyan American was the first company to begin drilling operations. It started a well in northern Cyrenaica east of Bengasi. The test was drilling

PUERTO RICO REFINING

Company—Refinery location—	Bbl. per stream day: Crude dist.	Cracking	Other processing
Caribbean Ref. Co.—San Juan	13,500	13,100 TC	V-9,000, Poly-500
Commonwealth Oil Refg. Co., Inc.—Guayanilla	23,520	26,800 Hd (1)	(1)V-13,800, Alky-1,400, Poly-900, Hf-3,730
Total	37,020	39,900	

(1) Expansion program under way to add 35,280 bbl. crude unit, 20,600-bbl. vacuum distillation, 26,800-bbl. Houdriflow cat cracker (50 per cent fresh feed and 50 per cent recycle), 3,730-bbl. Houdriformer, and 1,470-bbl. product output cat poly unit.

URUGUAY REFINING

Company—Refinery location—	Bbl. per stream day: Crude dist.	Cracking	Other processing
Administracion Nacional de Combustibles, Alcohol y Portland Refineria ANCAP-Montevideo—Teja	(1)28,000	(2)2,000 TC	V-750, A-350
Total	28,000	2,000	

(1) Additional units planned include 28,000-bbl. crude unit, 10,000-bbl. vacuum unit, 5,000-bbl. fluid cat cracker, 3,000-bbl. Platformer. (2) Also operates as atmospheric unit.

board Exploration Co. of Illinois; Bandini Petroleum Co.; Story J. Sloan, Houston; Antonio Molina Murillo, and Petroleos Atlas de Guatemala.

. . . Netherlands West Indies. The world's leading export refining industry is carried on in Aruba and Curacao Islands. The Aruba refinery of Lago Oil & Transport Co., Ltd. (Standard Oil Co. of New Jersey), has a capacity of 440,000 bbl. daily. The Curacao plant of N. V. Curacaosche Petroleum Industries Mij. (Royal Dutch-Shell) has a capacity of 210,000 bbl. daily. The refineries operate on Venezuelan crude.

. . . Other Caribbean. Barbados Gulf Oil Co., which holds about half of Barbados under concession, made a gas-distillate discovery near the center of the island. British Union Oil Co. has a concession on remaining acreage.

Commonwealth Oil Co. continued a three-well drilling program on Ile de la Gonave, part of the company's Haiti concession. Stanolind Oil & Gas Co. drilled a well in Jamaica, on a license acquired from Base Metals Mining Corp., Ltd., Toronto, which retained 25 per cent interest. In the Bahamas, Standard Oil Co. of California and Gulf Oil Corp. subsidiaries carried on marine seismic work in Cay Sal area.

URUGUAY

• The state-owned Adminstracion Nacional de Combustibles, Alcohol y Portland (A.N.C.A.P.) has an expansion program under way at the country's one refinery. The agency, which also controls all exploration, has contracted for a total of 12 wells. The first four completed were dry. Some noncommercial oil shows have been encountered.

ahead at 8,800 ft. at the end of November.

Land mines planted in desert fighting during World War II are a plague to operations in many areas. One company, D'Arcy, has a major clearance program under way.

. . . Algeria. French companies are playing for big stakes in the wastes of the Sahara Desert.

Intensive wildcatting is being carried on in regions where it would take vast reserves to make a pipeline to the Mediterranean pay out. Two discoveries have been made deep in the interior. Instead of the usual offset wells, confirmation tests are spotted miles away.

There are reports, unconfirmed late this year, that one field may have reserves of 7 billion barrels. The field, Hassi Messaoud, 63 miles southwest of Ouargla, is said to cover 3,600 sq. miles and have a 60-ft. pay. The discovery was made by Soc. Nationale de Recherche et d'Exploitation des Petroles en Algeria (SNREPAL), owned jointly by the French and Algerian governments.

The other discovery was the Edjele 101, completed in January near the Libyan border. It tested at 19 bbl. per hour. Cie. de Recherches et d'Exploitation de Petrole au Sahara (C.R.E.P.S.) made the discovery. Since then, four more tests were drilled on an 18-mile north-south axis, and a 72-mile east-west axis. Three of the four came in as producers capable of 56 bbl. per hour. The wells are shut in.

Three other companies were active in exploration. They were Ste. des Petroles d'Aumale, which operates the country's only producing field, Cie. Francaise des Petroles d'Algerie, and Cie. des Petroles d'Algerie.

A total of 23 wildcats were drilled the first half, including the 2 oil and 3 natural-gas discoveries. Total footage was 102,336 ft. Of seven development wells, six were completed as oil producers and one as a gas well. Seventeen wildcats and five develop-

FRENCH MOROCCO REFINING

Company—Refinery location—	Bbl. per stream day: Crude dist.	Cracking	Other processing
Ste. Cherifienne des Petroles: Petitjean	2,300	1,800 TCC	
Total	2,300	1,800	

SOUTH AFRICA REFINING

Company—Refinery location—	Bbl. per stream day: Crude dist.	Cracking	Other processing
Standard-Vacuum Refining Co. of South Africa, Ltd.—Durban	21,100	2,000 Vis 6,300 FCC	V-3,200, Poly-1,225, A-240
Total	21,100	8,300	

ment wells were planned the second half.

...French Morocco. Ste. Cherifienne des Petroles, operator of the small fields in the country, drilled seven wildcats without success the first half of 1956. Six more were planned for the second half. Three out of three development wells were completed as producers, and seven more were planned by the end of the year.

...Tunisia. Exploration in the country has been generally discouraging in past years, and there were no indications in 1956 that prospects had improved. The only private company active in the country was Royal Dutch-Shell, with 65 per cent interest in Cie. des Petroles de Tunisie. French and Algerian interests own the only other company in Tunisia, SEREPT, which operates a small natural-gas field in Cap Bon Peninsula. The gas is moved to Tunis.

UNION S. AFRICA

● Gasoline and other products were marketed throughout the year from the coal-to-oil plant of South African Coal, Oil & Gas Corp., Ltd., (S.A.S. O.L.), located 50 miles south of Johannesburg at Coalbrook. But technical troubles in the pioneering project caused delays and full production of about 5,000 bbl. daily of gasoline is not expected until the end of 1956. The country's only other source of domestic oil is torbanite, which supplies about 600 bbl. daily in gasoline and bitumen. Standard-Vacuum Oil Co. operates the Union's only refinery, a 21,100-bbl. daily plant near Durban.

EAST AFRICA

● Several exploration programs went forward in East Africa. Sinclair Somal Corp. spudded a well, 1 Gera, 27 miles west of Obbia in Somalia in June. More than 4,000 tons of gear was brought ashore by a beach landing for the test. Sinclair has half interest in the 56,000,000-acre concession. Other participants are Amerada Petroleum Co., Continental Oil Co., and Ohio Oil Co. A branch of the Italian Government company, E.N.I., is drilling in northern Somalia. Sinclair also had one rig in Ethiopia, where it has a concession over the entire country.

D'Arcy Shell Petroleum Development Co. of Tanganyika started a well on Zanzibar in May. Earlier, a test on Mafia Island was completed as a dry hole at 11,051 ft.

Conorada Petroleum Corp. and Standard-Vacuum Oil Co. continued surveys on concessions in British Somaliland. Stanvac expects to begin drilling within a few months. Moriqui Exploration Co. let its exploration license lapse on 7,000 sq. miles in February.

Ste. des Petroles de Madagascar had one rig operating early in 1956 on its 66,000-sq.-mile concession on the western side of the island.

WEST AFRICA

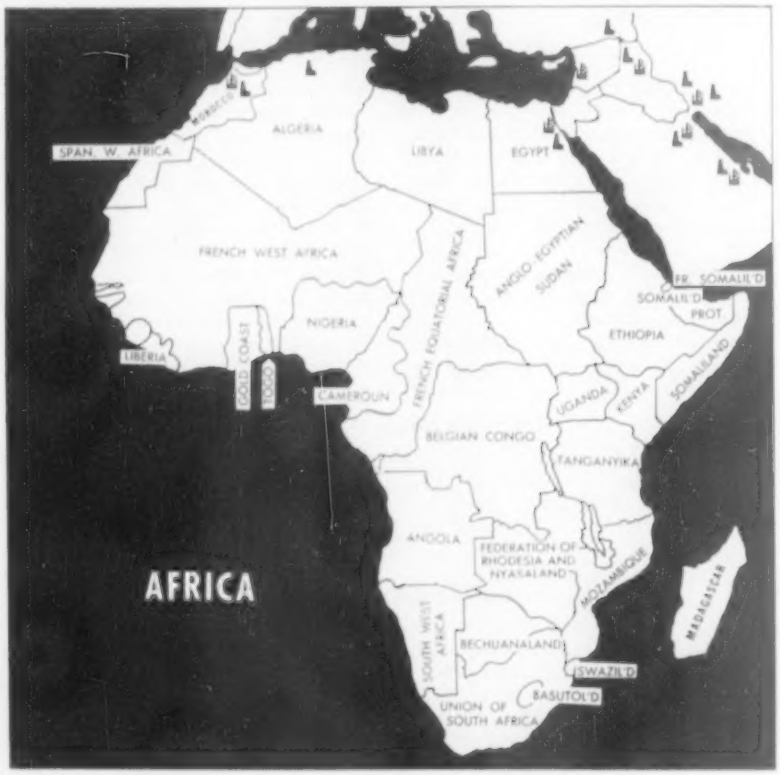
● The multimillion-dollar exploration programs in the coastal basins of West Africa gave further promise this year.

In Gabon, Ste. des Petroles de Afrique Equatoriale Francaise, which has been drilling on structures related to salt domes, is developing a field near Port-Gentil. Output is expected to average about 2,000 bbl. daily next year, and the first tanker shipment from Port-Gentil is planned for March. In the French Cameroons, the company is considering commercial output of a gas-condensate discovery.

The "first good show of free oil" in Nigeria was found in a 12,000-ft. wildcat east of Port Harcourt drilled by Shell-British Petroleum Prospecting Co. Confirmation offsets were under way at the end of this year. Socony-Vacuum Oil Exploration Co. (Nigeria) is making preliminary surveys in the northern part of the country.

Cia. dos Combustiveis do Lobito (Purfina), a subsidiary of Petrofina, continued to develop Benfica field south of Luanda in Angola. A crude line from the field to the coast is under construction. In anticipation of commercial production, the operating company and Portuguese Government made an agreement for the formation of an exploration company and for the construction of a 10,000 to 20,000-bbl.-daily refinery which would operate on local and imported crude. The refinery is still under study. Another Petrofina company carried on limited exploration work in Belgium Congo during the year.

In other developments, British Petroleum Co., Ltd., and Ste. des Petroles du Senegal arranged for joint exploration activity in French West Africa and Gambia. Gulf Oil Corp. through Gold Coast Gulf Oil Co. obtained a concession in February of over 100 sq. miles of land and an adjacent 100 sq. miles of coastal and lagoon waters of Gold Coast. Exploration work got under way this year.



EXPLORATION DRILLING PRODUCING PIPELINE REFINING

INTERNATIONAL OIL DIRECTORY

Here's an up-to-date and useful listing of oil companies operating outside the U. S. and Canada, together with their home-office addresses and principal officers. Data on ownership, operations, and expansion plans are presented. Companies engaged exclusively in marketing are not included.

ADMINISTRATION NACIONAL DE COMBUSTIBLES, ALCOHOL Y PORTLAND (ANCAP), Av. Agraciada y Paraguay, Montevideo, Uruguay, S.A.

• The alcohol and crude-refining administration of the government. Operates a 28,000-bbl. daily refinery at Montevideo, and has transportation and storage facilities. Contracts for some exploration work.

Officers: J. P. Fabini, pres.; Q. I. Moltedo, v.p.; F. F. T. Lespade, gen. mgr.; E. P. Prins, oil dept. mgr.

AGIP MINERARIA, S.p.A., Via F. lli Gabba 1, Milan, Italy.

• An operating company owned almost entirely by the government's Ente Nazionale Idrocarburi (E.N.I.). Handles a large share of all phases of the industry in Italy: exploration, production, refining, and marketing. Also has majority or minority interests in several other companies.

Officers: E. Mattei, pres.

AMERICAN INDEPENDENT OIL CO. (AMINOIL), 111 Sutter Street, San Francisco.

• Holds concession over Kuwait's undivided half interest in the Neutral Zone. Company expected 15,700 bbl. daily during first half of 1956. Output comes from Burgan sand in Wafra field.

Officers: R. K. Davies, pres.; C. Ide, sec.-treas.; S. B. Mosher, v.p.; R. W. Ickes, v.p.; J. MacPherson, v.p. and gen. mgr. in Kuwait.

AMERICAN INDEPENDENT OIL CO. DE MEXICO, S.A. DE C.V., 1-204 Reforma, Mexico City, D.F., Mexico.

• Operator for American Independent in a joint exploration and development program contract with Petroleo Mexicanos. Aminoil holds 43⅓ per cent; Mexofina, 43⅓ per cent; E. W. Pauley, 13⅓ per cent. Development area is in eastern Isthmus of Tehuantepec. Group presently produces about 1,000 bbl. daily.

Officers: R. K. Davies, pres.; C. Ide, sec.-treas.; W. R. Ickes, v.p.; G. Calleya, gen. mgr.

"ALBATROS" SOCIETE ANONYME BELGE POUR LE RAFFINAGE DE PETROLE, Petroleumkaai 10, Antwerp, Kiel, Belgium.

• Operates 12,000-bbl.-daily refinery.

Officers: A. Rosenzweig, R. Tailmant, mgrs.

AMPOL EXPLORATION, LTD., Buchanan Street, Balmain, N.S.W., Australia.

• Holds 20 per cent interest in West Australian Petroleum Pty., Ltd., in a joint exploration venture with California Texas Corp. It is owned 70 per cent by Ampol Petroleum, Ltd., an Australian importing and marketing firm.

Officers: L. J. Thompson, chairman; W. G. Walkley, man. dir.; E. O. Foster, sec.

ANDIAN NATIONAL CORP., LTD., 396 Alhambra Circle, Coral Gables, Fla.

• Operates a 335-mile, 10-in. crude pipeline in Colombia. The line connects the De Mares concession of Empresa Colombiana de Petroleos and Shell Oil's Casabe concession with a terminal on Cartagena Bay. Line capacity is 70,000 bbl. daily.

Officers: W. C. Kirkpatrick, pres.; J. J. Waybright, v.p.; P. R. Rathff, gen. mgr. in Colombia.

ANGLO-ECUADORIAN OILFIELDS, LTD., 59 Pall Mall, London, S.W.1., England.

• Producing and refining company. Output of 8,500 bbl. daily comes from 320 sq. miles of concessions near Santa Elena on Ecuador's coast. Operates a 5,600-bbl.-daily refinery at La Libertad, and will build a new refinery by mid-1958 large enough to supply domestic demand. Company is jointly owned by Lobitos Oilfields, Ltd., and South American Gold & Platnum Co.

Officers: F. C. Browning, chair.; L. W. Berry, gen. mgr.; G. W. V. Rumble, field mgr.

APEX (TRINIDAD) OILFIELDS, LTD., 208-224 Salisbury House, London Wall, London, E.C. 2, England.

• A producing company. Crude and condensate output totals about 9,000 bbl. daily from about 400 wells on 48,800 acres in Trinidad.

Officers: M. Maclachlan, chair. & joint

man. dir.; F. R. Cottell, joint man. dir.; J. L. Mowll, gen. mgr.

"AQUILA" SOCIETA PER AZIONI TENICO-INDUSTRIALE, Avv., L. Fattorello, via Dante No. 5, Trieste, Italy.

• Operates a 15,000-bbl. daily refinery near Trieste, Italy. Compagnie Francaise des Petroles is 50 per cent owner.

Officers: Dott. Ing. D. Guicciardi, gen. mgr.; Ing. T. L. de Pastrovich, tech. mgr.

AQUITAINE, SOCIETE NATIONALE DES PETROLOLES D' AQUITAINE, 12 Rue Jean Nicot, Paris 7, France.

• Operates a major natural gas field still under development and a small oil field at Lacq, in southern France. Crude output is 3,500 bbl. daily.

Officers: A Blanchard, pres. & gen. mgr.

ARABIAN AMERICAN OIL CO., Dhahran, Saudi Arabia, also: 505 Park Avenue, New York 22.

• Aramco holds a concession from the Saudi Arabian Government over about 400,000 sq. miles in the eastern part of the kingdom. Crude output the first 8 months of 1956 averaged 1,040,100 bbl. daily from about 150 flowing wells. Abqaiq, Ghawar, Qatif, and Damman are producing fields. Safaniya, Abu Hadriya, and Fadhili fields are shut in. Company also operates a 189,000 bbl. daily refinery at Ras Tanura.

Aramco ownership is held by: Standard Oil Co. (California), 30 per cent; The Texas Co., 30 per cent; Standard Oil Co. (N. J.), 30 per cent; and Socony Mobil Oil Co., Inc., 10 per cent.

Officers: F. A. Davies, chair.; R. G. Follis, v. chair.; R. L. Keyes, pres.; E. G. Voss, treas.; J. H. McDonald, v.p. & sec.

"ASTRA," COMPANIA ARGENTINA DE PETROLEO SOCIEDAD ANONIMA, Avenida Alem 621 (R.I.), Buenos Aires, Argentina.

• A private Argentine company with acreage in Comodoro Rivadavia fields. Crude output has declined in recent years. Production in 1956 averaged 2,600 bbl. daily.

Officers: R. Gruneisen, pres.; E. R. Pemberton, v.p.

ANTAR, PETROLES DE L'ATLANTIQUE, 4 Rue Leon Jost, Paris.

• A refining company. Operates a 35,000-bbl.-daily refinery at Donges, on the west coast of France.

Officers: C. A. Lambert, pres. and gen. mgr.

ATTOCK OIL CO., LTD., Rawalpindi, Punjab, Pakistan, also: 24-28 Lombard Street, London.

• A producing and refining company in West Pakistan. Operates a 4,000-bbl.-daily refinery at Rawalpindi, which processes Attock-controlled crude and production of Pakistan Petroleum, Ltd., a Burmah Oil Co., Ltd., subsidiary. Attock has crude output through 70 per cent interest in Pakistan Oilfields, Ltd. The Pakistan Government holds the remaining 30 per cent. Output of about 4,000 bbl. daily comes from Joya Mair, Balkassar, Khaur, and Dhulian fields.

Officer: T. T. McCreath, chair.

BAHRAIN PETROLEUM CO., LTD., 380 Madison Avenue, New York.

• Holds concession over Bahrain and adjacent Persian Gulf islands controlled by the ruling shaikh. Crude output is stabilized at 30,000 bbl. daily from about 100 flowing wells. Company also operates 204,000-bbl.-daily refinery, which operates on local crude and supplies purchased from Arabian American Oil Co. Standard Oil Co. of California and The Texas Co. are joint owners.

Officers: W. H. Pinckard, chair.; W. F. Bramstedt, pres.

BASRAH PETROLEUM CO., LTD., 214 Oxford Street, Oxford Circus, London.

• Holds a concession over southern Iraq. Production from Zubair and Rumaila fields first 7 months of 1956 averaged 174,800 bbl. daily. Output comes from about 41 flowing wells. Company operates a 70-mile, 12-in., and 65-mile, 24-in. pipeline to Fao terminal on the Persian Gulf. Company is owned by parent companies of Iraq Petroleum Co., Ltd., in same proportion of interest.

Officers: Adm. Sir J. H. D. Cunningham, chair.; G. W. Dunkley, exec. dir.; G. H. Herridge, exec. dir.; H. S. Gibson, man. dir.

BRITISH PETROLEUM CO., LTD., Britannic House, Finsbury Circus, London.

• An integrated company with exploration, production, transportation, refining, and marketing operations. Exploration programs are under way, either singly or jointly over wide areas including Papua, East Africa, Nigeria, Sicily, Libya, Gambia, Kamaran Islands, and in the Persion Gulf off Abu Dhabi.

Most B.P. crude production is in the Middle East through operating companies in which it has a substantial interest. It also has an interest in some Trinidad and Canadian output. Total output of B.P. in 1955 was 920,000 bbl. daily. B.P. producing interests include 40 per cent interest in the Iranian consortium, half interest in Kuwait Oil Co., and 23¾ per cent interest in the Iraq Petroleum Co., Ltd., group of firms which produce crude in Iraq and Qatar.

Refinery runs in 1955 totaled 590,000 bbl. daily. Refineries in which B.P. group companies either own or have a substantial interest include: Kent, Llandarcy, and Grangemouth in the United Kingdom; six plants in Europe; and refineries at Haifa, Israel; Abadan, Iran; Mina-al-Ahmadi, Kuwait; Aden; and Kwinana, Western Australia.

At the beginning of 1956, B.P. Tanker Co.'s fleet consisted of 144 vessels totaling 2,018,000 tons. About 2½ million tons were under charter, and another 41 ships totaling 1,225,500 tons were in order.

Originally formed in 1909 as Anglo-Persian Oil Co., Ltd., to handle concession in Iran. Name was changed in 1935 to Anglo-Iranian Oil Co., and to the present name in 1954. Controlling interest in held by the British Government.

Officers: Managing directors: B. R. Jackson, chair.; N. A. Gass, deputy chair.; M. R. Bridgeman, E. H. O. Elkington, J. M. Pattinson, and H. E. Snow. T. MacDonald, sec.

BURMAH OIL CO., LTD., 175 West George Street, Glasgow, Scotland.

• Carries on integrated operations in Burma, India, and Pakistan directly and through wholly or partially owned subsidiaries.

Burma: Company has 55 per cent interest in Burma Oil Co. (1954), Ltd., which operates 3,000 bbl. daily refinery at Chaulk and was completing a 4,000-bbl.-daily plant at Syriam, near Rangoon. Crude output meets refining needs.

India: Has 50 per cent interest in 40,000-bbl.-daily refinery of Burmah-Shell Refineries, Ltd., at Bombay. Through Assam Oil Co., Ltd., operates a 5,900-bbl.-daily refinery at Digboi, and produces about 7,500 bbl. daily from Digboi and Nahorakatiya fields. The latter is still under development and has proved reserves of 300,000,000 bbl. or more.

Pakistan: Has 70 per cent interest in Pakistan Petroleum, Ltd., which has an interest in Sui Gas Transmission Co., Ltd. P.P.L. also has small crude production.

Officers: Sir K. B. Harper, chair.; W. E. Eadie, man. dir.; R. P. Smith, assist. man. dir.

CALIFORNIA TEXAS CORP (CALTEX), 380 Madison Avenue, New York.

• Caltex group is composed of 94 companies doing business in all phases of the industry in 67 countries of the Eastern Hemisphere. Crude production in 1955 from Central Sumatra, Bahrain Island, and Netherlands New Guinea amounted to 93,200 bbl. daily. Refinery runs in 1955 averaged 320,500 bbl. daily. Its wholly or partially owned refineries are located at Pernis, Netherlands; Bec d'Ambes, France; Cartagena, Spain; San Martino, Italy; Sidon, Lebanon; Bahrain Island; Batangas Bay, Philippins Islands; Marifu, Yokohama, and Kudamatsu, Japan; and Sydney and Kurnell, Australia. Exploration is carried on by American Overseas Petroleum, Ltd., in many areas, including the Philippines, Western Australia, and Libya. Caltex is jointly owned by Standard Oil Co. of California and The Texas Co.

Officers: W. H. Pinckard, chair.; W. F. Branstedt, pres.; A. E. Thayer, vp. and sec.

CITIES SERVICE CO., 60 Wall Street, New York.

• Exploration programs are under way in several foreign areas. A wholly owned subsidiary, Peruvian Pacific Petroleum Co. has half interest in 2,500,000 acres in eastern Peru and 250,000 acres in northern Peru. Richfield Oil Corp. holds the other half interest. Company also holds jointly with Richfield a 32,000-sq.-mile concession over Dhofar, in southern Arabia. It is one of four American independents which own Sahara Petroleum Co., holder of an 88,000-sq.-mile concession in Egypt's western desert.

Officers: W. A. Jones, chair.; B. S. Watson, pres.; E. G. Christian, sec.

COLOMBIAN PETROLEUM CO., Apartado 100, Cucuta, Colombia.

• Holds 460,000-acre Barco concession in eastern Colombia where production is about 27,000 bbl. daily, and a 267,000-acre concession further west. Joint owners are Socony Mobil Oil Co., Inc., and The Texas Co.

Officers: F. H. Wilcox, pres.; D. E. Park, exec. v.p.; C. O. Isakson, v.p. and mgr.

COLON DEVELOPMENT CO., LTD., Apartado 809, Caracas, Venezuela.

• The smaller of two Royal Dutch-Shell group companies which have production in Venezuela. It produces about 20,000 bbl. daily from concessions southwest of Lake Maracaibo. Concessions cover nearly 500,000 acres. Canadian Shell, Ltd., owns about 96 per cent interest.

Officers: I. D. Davidson, chair.

CIE. FINANCIERE BELGE DES PETROLES, S.A. (PETROFINA), 31 Rue de la Loi, Brussels, Belgium.

• An integrated company with controlling interest in tanker, refining, marketing, or producing companies in Europe, Africa, Mex-

ico, Canada, and the United States. It entered the United States industry in 1956 by the acquisition of Panhandle Oil Corp. through American Petrofina.

Officers: Vis. Alois Van de Vyvere, chair.; Jules Moreau de Melen, v. chair. and man. dir.; Laurent Wolters, v. chair. and man. dir.

CIE. FRANCAISE DES PETROLES, 11 Rue du Docteur Lancereaux, Paris.

• C.F.P. has a 23¾ per cent interest in Iraq Petroleum Co., Ltd., and affiliate companies, and 6 per cent interest in Iranian Oil Participants, Ltd. It has 56 per cent interest in Cie. Francaise de Raffinage, which has two refineries in France, and has a stake in a transportation company and an Italian refining company. Company also has interests in exploration in the French Union and Canada. The French Government is the leading stockholder with 40 per cent voting interest.

Officers: V. de Metz, pres. and man. dir.; R. Tassin de Montaigu, mgr.

CIA. ESPANOLA DE PETROLES, S.A., Apartado 671, Alcala 31, Madrid, Spain.

• Operates refinery at Sta. Cruz de Tenerife, Canary Islands, newly enlarged to 65,000 bbl. daily, and has 24 per cent interest in the Escombreras refinery near Cartagena. A subsidiary, Cia. de Investigacion, is carrying on exploration on the mainland. C.E.P.S.A. also has royalties on 2,000-bbl.-daily production in Venezuela from acreage in Lake Maracaibo basin and Monagas.

Officers: I. Villalonga, pres.; Baron de Viver, v.p.; D. J. Lliso-Moreno, man. dir.

CONORADA PETROLEUM CORP., 630 Fifth Avenue, New York.

• Exploration subsidiary in areas outside North America for Amerada Petroleum Corp., Continental Oil Co., and Ohio Oil Co. Its current areas of activity include Africa and Central and South America.

Officers: C. F. Dohm, pres.; B. F. Uhl, Jr., v.p.

CREOLE PETROLEUM CORP., Empire State Building, 350 Fifth Avenue, New York.

• A subsidiary of Standard Oil Co. (N. J.), company is leading crude producer in Venezuela. Output averaged 1,055,100 bbl. daily first 8 months of 1956, largely from fields in Lake Maracaibo and in Greater Oficina area in Eastern Venezuela. The company operates a 224,000-bbl.-daily refinery at Amuay, and a 70,000-bbl.-daily plant at Caripito. It also has a transportation company operating a tanker fleet and bulk terminals.

Officers: H. W. Haight, pres.; H. A. Jarvis, exec. v.p.; D. E. Stines, v.p.; H. A. Metzger, v.p.; L. M. Eldridge, east. div. mgr.; H. B. Hegglund, west. div. mgr.; W. B. Cleveland, Amuay ref. mgr.

DAIKYO OIL CO., LTD., 1-1 Kyobashi, Chuo-ku, Tokyo, Japan.

• Operates a 25,000-bbl.-daily refinery at Yokkaichi, Japan.

Officers: M. Takahashi, pres.; Yoshiro Nakayama, ref. supt.

C. DEILMANN BERGBAU, G.m.b.H., Postfach 20, Bentheim, West Germany.

• Has interests in natural gas and crude production in several West German fields. Carries on an exploration program in Spain and Greece jointly with local companies. It also has concession acreage in Turkey, and has an exploration contract with Yeman.

Officers: Dr. C. Deilmann, dir.; Dr. H. Gunther, dir.

DEUTSCHE ERDOEL-AKTIENGESELLSCHAFT, DEA Haus, Mittelweg 180, Hamburg, West Germany.

• Operates fields in several areas of West Germany, and has a 12,600-bbl.-daily refinery at Heide, and a 1,400-bbl. plant at Wietze.

Officers: A. Ritter, chair.; Dr. A. von Burgsdorff-Garath, Karl Schirner, F. H. Ulrich, deputy chair.

GETTY OIL CO., 1060 Subway Terminal Bldg., Los Angeles.

• The company, formerly Pacific Western Oil Corp., holds a concession over Saudi Arabia's one-half undivided interest in the Neutral Zone. Exports the first half of 1956 averaged 13,600 bbl. daily.

Officers: J. P. Getty, pres.

GULF OIL CORP., Gulf Building, Pittsburgh, Pa.

• An integrated company active directly or indirectly in exploration, production, transportation, refining, and marketing in most areas of the free world.

Gulf's net crude production in 1955 was 886,200 bbl. daily, of which 230,700 bbl. daily was produced in the United States, 153,200 bbl. daily in other areas in the Western Hemisphere, and 502,300 bbl. daily in the Eastern Hemisphere.

The main source of crude is Kuwait through 50 per cent interest in Kuwait Oil Co., Ltd. Total output the first 8 months of 1956 averaged 1,176,800 bbl. daily. Gulf also has a 7 per cent interest in the Iranian consortium.

A wholly owned Venezuelan subsidiary, Mene Grande Oil Co., had an output of 353,800 bbl. daily the first 8 months of 1956. Gulf has a 50 per cent share in this production due to ownership in production by companies.

A subsidiary, Gulf Italia Co., was producing about 10,000 bbl. daily in Sicily at mid-year 1956.

Only about 10.5 per cent of the Gulf's total refinery runs of 587,900 bbl. daily in 1955 were accounted for by foreign refineries.

The corporation has half interest in the 30,000-bbl.-daily Mina-a-Ahmadi refinery in Kuwait, two-thirds interest in a 59,000-bbl.-daily plant of Venezuelan Gulf Refining Co., and a 7 per cent share of output from Abadan refinery in Iran.

In October 1956, Gulf's domestic and foreign ocean-going tanker fleet consisted of 27 vessels.

Officers: S. A. Swensrud, chair.; W. K. Whiteford, pres.; D. Proctor, exec. v.p.; C. W. Hamilton, v.p. foreign prod.

INTERNATIONAL PETROLEUM CO., LTD., 396 Alhambra Circle, Coral Gables, Fla.

• A subsidiary of Standard Oil Co. (N. J.), the company through operating firms carries on integrated operations in Colombia and Peru, and has 25 per cent ownership in crude production of Mene Grande Oil Co. in Venezuela. Crude output from all sources in 1955 was 95,000 bbl. daily.

In Colombia, about 1,700,000 acres were under concession or lease at end of 1955. There were applications on another 13,000,000 acres. Small output came from Totumal and Buturama concessions. The company's Barrancabermeja refinery plus the La Dorada topping plant had combined runs of 34,800 bbl. daily in 1955. A 26,500-bbl.-daily refinery is under construction at Cartagena.

In Peru, company had under concession 1,500,000 acres in the coastal region. Another 2,500,000 acres in the Amazon region were applied for. Its production from coastal fields in 1955, including its interest from joint operations with Cia. Petrolera Lobitos, was 31,000 bbl. daily. Runs at the company's Talara refinery were 39,900 bbl. daily in 1955.

Officers: M. L. Haider, pres.; I. R. Cunningham, v.p.; Orby C. Wheeler, v.p.

IRAANSE AARDOLIE EXPLORATIE EN PRODUCTIE MIJ. (IRANIAN OIL EXPLORATION & PRODUCTION CO.) N.V., Teheran, Iran.

• Exploration and producing company under agreement of October 1954 between eight consortium companies, the Iranian Government, and National Iranian Oil Co. Main fields are Aghi Jari, Haft Kel, Masjid-i-Sulaiman, Naft Safid, Lali, and Gach Saran. Output first 8 months 1956 averaged 519,000 bbl. daily.

IRAANSE AARDOLIE RAFFINAGE MIJ. (IRANIAN OIL REFINING CO.) N.V., Teheran, Iran.

• Refining company under agreement of October 1954 between eight consortium companies, the Iranian Government, and National Iranian Oil Oil Co. Operates Abadan refinery of 585,000-bbl.-daily capacity. Output first 8 months 1956 averaged 210,000 bbl. daily.

IRANIAN OIL PARTICIPANTS, LTD., Beaufort House, Gravel Lane, London.

• Holding company for producing and refining companies organized in Iran in October 1954 under an agreement between eight consortium companies, the Iranian Government, and National Iranian Oil Co. Member companies hold shares in Iranian Oil Participants according to their interest in the operation. The eight companies, plus nine others which divided a 5 per cent interest transferred from original American participants, and their respective interests are: British Petroleum Co., Ltd., 40 per cent; Royal Dutch-Shell, 14 per cent; Cie. Francaise des Petroles, 6 per cent; 7 per cent each, Standard Oil Co. (N. J.), Socony-Mobil Oil Co., Inc., Gulf Oil Corp., The Texas Co., and Standard Oil Co. of California; and a total of 5 per cent in varying fractions through Iricon Agency, Ltd.: American Independent Oil Co., Atlantic Refining Co., Hancock Oil Co., Getty Oil Co., Richfield Oil Corp., San Jacinto Petroleum Corp., Signal Oil & Gas Co., Standard Oil Co. (Ohio), and Tidewater Oil Co.

Officers: J. Addison, gen. mgr.

IRANIAN OIL SERVICES, LTD., Beaufort House, Gravel Lane, London.

• Purchasing and service company outside Iran for Iraanse Aardolie Raffinage Mij. (Iranian Oil Refining Co.) N.V. and Iraanse Aardolie Exploratie en Productie Mij. (Iranian Oil Exploration and Producing Co.) N.V.

Officers: H. W. Rigden, gen. mgr.

IRAQ PETROLEUM CO., LTD. 214 Oxford St., Oxford Circus, London.

• Produces crude from 32,000-sq.-mile con-

cession in northeastern Iraq. Output averaged 512,900 bbl. daily first 9 months of 1956, mostly from Kirkuk field, where production came from 44 flowing wells at beginning of year. Other fields are Bai Hassan and Jambur.

I.P.C. operates a pipeline system to Mediterranean terminals at Tripoli, Lebanon, and Banias, Syria. Under normal conditions, the system consists of a 12 and 16-in. line to Tripoli, and a 30-32-in. line to Banias. A 24-in. loop terminating in Banias was begun late in 1956. A 12-in. and an unfinished 16-in. line to Haifa, Israel, are not in use. The lines were shut down due to sabotage during the Middle East crises late in 1956.

Companies affiliated with I.P.C. produce crude in other areas of Iraq and in Qatar, carry on exploration in Southern Arabian territories, and operate a 11,550-bbl.-daily refinery at Tripoli.

Interest in I.P.C. is held by: British Petroleum Co. Ltd., 23¾ per cent; Royal Dutch-Shell, 23¾ per cent; Cie. Francaise des Petroles, 23¾ per cent; Standard Oil Co. (N.J.) and Socony Mobil Oil Co., through Near East Development Corp., 23¾ per cent; and Participations & Exploration Corp. (Gulbenkian estate) 5 per cent.

Officers: Adm. Sir. J. H. D. Cunningham, chair.; Sir H. S. Gibson, man. dir.

KERN OIL CO., LTD., Kern House, 36 & 38 Kingsway, London.

• The company is a British firm active in the Western Hemisphere. In California, Kern output late last year was more than 100,000 bbl. daily from 553 wells on 7,500 acres of private and leased land.

Kern Trinidad Oilfields Ltd. has interests in about 20,200 acres, including some offshore areas. Its output is around 3,000 bbl. daily on the island.

Kern-Mex Oilfields, S.A. has an interest in 28,500 acres in Veracruz, Mexico. Some production comes from the acreage.

Officers: George W. Ivey, chair.; R. H. Young, man. dir.; F. M. Ziegler, dir. & gen. mgr.

N. V. KONINKLIJKE NEDERLANDSCHE PETROLEUM MIJ. (ROYAL DUTCH-PETROLEUM CO.), Carel van Bylandtlaan 30, The Hague, Netherlands.

• The company has 60 per cent ownership in the Royal Dutch-Shell group, the remaining 40 per cent held by "Shell" Transport & Trading Co., Ltd.

Royal Dutch Petroleum and Shell Transport have directly or indirectly a controlling or large interest in companies throughout the free world active in all phases of the industry: exploration, production, transportation, refining, and marketing. Its crude supplies in 1955, including its own production and purchases under special contracts, were more than 1,900,000 bbl. daily. Refinery runs in 1955 were nearly 2,000,000 bbl. daily.

The main sources of crude in 1955 were: Shell Oil Co. in the United States, 350,000 bbl. daily; Cia. Shell de Venezuela & Colon Development Co. Ltd., 615,000 bbl. daily; British Malayan Petroleum Co. Ltd. in British Borneo, 110,000 bbl. daily; and in Indonesia, more than 100,000 bbl. daily. The Group also has a 23¾ per cent interest in production of Iraq Petroleum Co., Ltd., and affiliated companies, and a 14 per cent share in Iranian Oil Participants Ltd.

Refinery runs in leading areas in 1955 were: 510,000 bbl. daily in the United States, 550,000 bbl. daily in South America, 560,000 bbl. daily in Europe, and 260,000 bbl. daily in Asia and Australia.

At the beginning of 1956, the group tanker fleet totaled 2,800,000 tons. Another 4,900,000 tons were under charter.

Officers: L. E. J. Brouwer, gen man. dir.

KUWAIT OIL CO., LTD., 1 Great Cumberland Place, London.

• Operates 6,000-sq.-mile concession in Kuwait for British Petroleum Co. Ltd. and Gulf Oil Corp. Output first 8 months 1956 averaged 1,176,800 bbl. daily from about 200 flowing wells. Company also operates 30,000-bbl.-daily Mina-al-Ahmadi refinery.

Officers: C. A. P. Southwell, man. dir.

LAGO OIL & TRANSPORT CO., LTD., Aruba, Netherlands West Indies.

• An oil-refining and marketing company, the firm, a wholly owned subsidiary of Standard Oil Co. (N. J.), owns a 440,000-bbl. daily refinery at Aruba. Most of the crude is supplied by Creole Pet. Corp., also a Jersey Standard subsidiary.

Officers: J. J. Horigan, pres.; C. F. Smith, staff and service supt.; O. S. Mingus, v.p. and gen. mgr.; F. E. Griffen, gen. supt.; T. C. Brown, sec.-treas.

LAPIDOTH ISRAEL PETROLEUM CO., LTD., 33 Frishman Street, Tel-Aviv, Israel.

• Jointly with Israel Oil Prospectors, Ltd., operates Heletz field, 30 miles south of Tel-Aviv. Output of 700 bbl. daily late in 1955 came from 5 flowing wells.

Officer: I. Barnea, gen. mgr.

LOBITOS OILFIELDS, LTD., 59 Pall Mall, London.

• Producers, refiners, and marketers. A subsidiary, Cia. Petrolera Lobitos, produced 13,600 bbl. daily in 1955 from coastal fields of Peru, including its share from joint operations with International Petroleum Co., Ltd.

Company operates a 4,200-bbl.-daily refinery on the Manchester Ship Canal at Ellesmere Port.

Officers: F. C. Bowring, chair.; J. E. Hall, dir. & gen mgr.; J. S. Parker, refy. mgr.

MANABI EXPLORATION CO. INC., Bank of Commerce Bldg., Houston, Tex.

• Operates in Ecuador. Company produced 1,600 bbl. daily from Tigre and other fields in the coastal region in 1955 on a 57,246-acre concession purchased in 1951. Company also has added in exploration and exploitation concessions a total of 1,422,000 acres.

Firm owns a 450-bbl.-daily refinery plus asphalt facilities. Products are marketed locally.

Pantepec Oil Co. C. A. holds controlling interest in Manabi.

Officers: L. W. Storms, Jr., pres.; G. R. Grim, v.p. & gen. mgr. in Ecuador.

MENE GRANDE OIL CO., Gulf Bldg., Pittsburgh, Pa.

• The producing subsidiary in Venezuela of Gulf Oil Corp., wholly owned through Venezuela Gulf Oil Co. Output averaged 353,800 bbl. daily first 8 months of 1956 from 1,057,600 acres of producing areas in eastern and western Venezuela. Company holds 1,362,600 acres acquired by successful bidding in 1956.

International Petroleum Co., Ltd., and Cia. Shell de Venezuela each own a 25 per cent interest in Mene Grande production.

Officers: S. A. Swensrud, chair.; H. Sherman, pres.

MITSUBISHI OIL CO., LTD., 1 Kotohira-cho, Shiba, Minato-Ku, Tokyo, Japan.

• Operates a 29,400-bbl.-daily refinery at Kawasaki, Japan. A 25,000-bbl.-daily expansion was underway in mid-1956.

Tidewater Oil Co. has 50 per cent interest in the company.

Officer: S. Takeuchi, pres.

MOSUL PETROLEUM CO., LTD., 214 Oxford Street, Oxford Circus, London.

• Holds a concession over northwestern Iraq. Output from Ain Falah and Butmah fields first 8 months of 1956 averaged 25,800 bbl. daily. Crude is pumped into the main Iraq Petroleum Co., Ltd., pipeline system to the Mediterranean at K2 station via a 135-mile, 12-in. line.

An affiliate of I.P.C., company ownership is held by I.P.C. parent companies in same proportion.

Officers: Adm. Sir J. H. D. Cunningham, chair.; Sir H. S. Gibson, man. dir.

NIPPON OIL CO., LTD., No. 10, 3-chome, Marunouchi, Chiyoda-ku, Tokyo, Japan.

• A refiner and marketer. Company operates refineries of 4,000 bbl. daily at Akita, 3,600 bbl. daily at Niigata, and 1,500 bbl. daily at Kashiwazaki. At mid-1956, company had an additional 7,500 bbl. daily capacity under construction at Niigata.

The company and Caltex each have half interest in Nippon Petroleum Refining Co., Ltd., which has a 40,000-bbl.-daily refinery at Yokohama, and a 15,000-bbl.-daily refinery at Kudamatsu.

Officers: Y. Sasaki, pres.; J. Kurita, v.p.

PAN-ISRAEL OIL CO., INC., care of First National Bank of Jersey City, Jersey City, N. J.

• Carries on oil exploration in Israel. Company operates jointly with Israel-Mediterranean Petroleum, Inc. Pantepec Oil Co., C.A., has a substantial interest in the two companies.

Officers: W. F. Buckley, pres.

PANTEPEC OIL CO., C.A., Edificio Urapal, Esquina de Urapal (Candelaria), Caracas, Venezuela.

• Producing company in Venezuela until late 1956 when acreage was purchased by Phillips Petroleum Co. Output averaged 5,500 bbl. daily first 8 months of 1956 from 32,564 acres under concession. Company has controlling interest in Manabi Exploration Co., Inc., which produced 1,600 bbl. daily in 1955 in Ecuador. Pantepec also has interest in Pan-Israel Oil Co., Inc., and Israel-Mediterranean Petroleum, Inc.

Officers: J. S. Baily, pres.; E. L. de Ceballos, v.p.

PETROLEO BRASILEIRO, S.A. (PETROBRAS), Av. Rio Branco, Rio de Janeiro, Brazil.

• The Brazilian Government's oil corporation. It handles exploration, production, and most refining in the country.

There was an extensive exploration program under way late in 1956 in the Amazon and

other basin areas. Output in August 1956 averaged 10,400 bbl. daily from 319 wells in the State of Bahia. The corporation operates refineries of 50,000 bbl. daily at Cubatao, and 15,000 bbl. daily at Mataripe.

Officers: Col. J. Nunes, pres.; W. K. Link, exploration mgr.

PETROLEOS MEXICANOS (PEMEX), Av. Juarez 94, Mexico City, D.F.

• The petroleum administration of the Mexican Government. Responsible for all phases of the nationalized oil industry: exploration, production, transportation, refining, marketing, and export. Operates directly all segments of the industry, although some exploration and production is farmed out on contract basis. Pemex operates 1,500 wells producing 250,000 bbl. per day; eight refineries, 408,500 bbl. per day charging capacity.

Officers: A. J. Bermudez, gen. man. dir. Exec. subdirectors: Lic P. Balboa G., admin.; F. Padilla G., finance; M. G. Leiva, commerce; J. Colomo, production. A. Garcia, explor. mgr. A. Barnetche, prod. mgr. C. L. Cocuera R., refining mgr. T. Reith, export mgr.

PHILLIPS PETROLEUM CO., Phillips Bldg., Bartlesville, Okla.

• In Venezuelan operations, company output first 8 months of 1956 averaged 10,600 bbl. daily from concessions covering 188,000 acres. Later in the year, it acquired Pantepec's production in the country. Company also has about one-third interest in American Independent Oil Co., which has operations in Mexico and the Neutral Zone.

Officers: K. S. Adams, chair.; P. Endacott, pres.

PREMIER CONSOLIDATED OILFIELDS, LTD., Finsbury Pavement House, Moorgate, London.

• Produced about 1,000 bbl. daily in 1955 from 19,700 acres on which it has rights in Trinidad.

Officers: P. S. Ashmead-Bartlett, chair.

QATAR PETROLEUM CO., LTD., 214 Oxford Street, Oxford Circus, London.

• Holds concession over Qatar. Output first 8 months of 1956 averaged 127,300 bbl. daily from about 34 flowing wells. Company is an affiliate of Iraq Petroleum Co., Ltd., and is owned by I.P.C. parent companies in same proportion of interest.

Officers: Adm. Sir J. H. D. Cunningham, chair.; Sir H. S. Gibson, man. dir.

RICHMOND EXPLORATION CO., 225 Bush Street, San Francisco.

• Producing company in Venezuela for Standard Oil Co. of California. Output averaged 53,500 bbl. daily the first 8 months of 1956 from about 521,000 acres under concession.

Officers: C. W. Reith, chair.; C. R. Cabrera, pres.

SACOR, SOC. ANONIMA CONCESSIONARIA DA REFINACAO DE PETROLEOS EM PORTUGAL, Rua do Alecrim 57, Lisbon, Portugal.

• Operates a 27,000-bbl. daily refinery near Lisbon. Company has exclusive refining rights in Portugal, and is guaranteed a market up to 50 per cent of local consumption.

Officers: J. B. dos Santos, pres.; E. B. Reis, gen. mgr.

SARAWAK OILFIELDS, LTD., Miri, Sarawak.

• A Shell Group company, firm operates a 47,500-bbl. daily refinery at Lutong in the State of Sarawak, British Borneo. Company also produced 1,400 bbl. daily the first half of 1956 from Miri field.

Officers: T. R. Groundwater, tech. mgr.

"SHELL" TRANSPORT & TRADING CO., LTD., 13 Austin Friars, London.

• Has 40 per cent ownership in the Royal Dutch-Shell group, whose member companies are active in all phases of the industry throughout the free world (see N. V. Koninklijki Nederlandsche Petroleum Mip.).

Officers: Sir F. Godber, chair. and man. dir.; Sir G. Legh-Jones, man. dir.; Sir F. Hopwood, man. dir.

SHELL TRINIDAD, LTD., St. Helen's Court, Great St. Helen's, London.

• A member of the Shell group, the company's name was changed from United British Oilfields of Trinidad, Ltd.

The company operates a 33,000-bbl. daily refinery at Point Fortin, Trinidad. It produced about 17,000 bbl. daily in 1955. The company has one-third interest, along with Trinidad Oil Co., Ltd., and British Petroleum Co., Ltd., in Trinidad Northern Areas, Ltd. This company is conducting offshore work in the Gulf of Paria.

Officers: Sir F. Godber, chair.

SOCONY MOBIL OIL CO., INC., 150 East 42nd Street, New York.

• An integrated company operating directly or indirectly in practically every country of the free world. It engages in exploration, production, transportation, refining, and marketing.

Gross crude production averaged about 680,000 bbl. daily the first half of 1956. About 60 per cent of the output came from areas outside the United States.

In the Western Hemisphere, the leading source of foreign crude is Venezuela where the company's output averaged about 90,000 bbl. daily the first 6 months.

About 35 per cent of the total production is from the Middle East through 10 per cent interest in the Arabian American Oil Co., 7 per cent interest in the Iranian consortium, and 11⅞ per cent interest in Iraq Petroleum Co., Ltd., and affiliated companies.

The company also has relatively small producing interests in Austria, West Germany, and Egypt.

Socony Mobil has half interest in Standard-Vacuum Oil Co., which had output of 72,000 bbl. daily in 1955, chiefly in Indonesia.

The company's domestic and foreign refining capacity totals about 750,000 bbl. daily. It has six refineries in Europe and has interests in Middle East refineries. Through Stanvac, it also has interests in refineries in South Africa, Indonesia, India, Australia, and Japan.

Officers: B. B. Jennings, chair. of exec. committee and of the board; A. L. Nickerson, pres.; vice presidents; P. V. Keyser, Jr., J. C. Case; J. F. Seal; C. S. Teitsworth, H. Willets.

SOUTH AMERICAN GULF OIL CO., Apartado Aeroe 3434, Bogota, Colombia.

• A transportation company jointly owned by The Texas Co. and Socony Mobil Oil Co., Inc., the firm operates a 260-mile, 12-in. pipeline. The line carries crude produced by Colombian Petroleum Co. in Barco Concession to a terminal on the Gulf of Morrosquillo.

Officers: F. L. Wilcox, pres.; D. E. Park, exec. v.p.; C. O. Isakson, mgr.

STANDARD OIL CO. OF CALIFORNIA, 225 Bush Street, San Francisco.

• The integrated company is directly or indirectly active in all phases of the oil industry, exploration, production, transportation, refining, and marketing, in most of the free world. Its gross crude and L.P.G. production in 1955 averaged 723,300 bbl. daily, 58 per cent of which came from areas outside the United States.

The company engaged in exploration or production in 15 Latin American countries. Its major source of crude in this area was Venezuela where its subsidiary, Richmond Exploration Co., produced 45,100 bbl. daily.

In the Middle East, California Standard has 30 per cent interest in Arabian American Oil Co. and 7 per cent interest in the Iranian consortium.

The company and The Texas Co. each hold 50 per cent interest in the Caltex group, which operates in 67 countries of the Eastern Hemisphere. Production in Indonesia, Bahrain, and New Guinea in 1955 averaged 93,200 bbl. daily.

Domestic and foreign refinery runs in 1955 averaged 692,500 bbl. daily, including California Standard's interest in Eastern Hemisphere operations, chiefly Caltex'. The group has 12 wholly or partially owned refineries in nine countries.

Officers: R. G. Follis, chair.; T. S. Petersen, pres.; vice presidents and directors: H. Brown, G. A. Davidson, T. L. Lenzen, G. Lund, E. J. McClanahan, G. L. Parkhurst.

STANDARD OIL CO. (New Jersey), 30 Rockefeller Plaza, New York.

• The company, through subsidiaries, carries on integrated activities in all parts of the free world. These include exploration, production, transportation, refining, and marketing.

Its total gross crude production in 1955 averaged 2,143,000 bbl. daily, of which 51 per cent came from Latin America, and 21½ per cent from the Eastern Hemisphere, chiefly the Middle East.

The company's main source of crude production is Venezuela where its 95 per cent-owned subsidiary, Creole Petroleum Corp., produced 981,000 bbl. daily. Its second leading source of crude in Latin America is 83 per cent-owned International Petroleum Co. which had 110,000 bbl. daily. Both Creole and International Petroleum also are engaged in transportation, refining, and marketing.

Jersey Standard's Middle East crude production and refining interests are through a 30 per cent interest in Arabian American Oil Co., 7 per cent in the Iranian consortium, and 12⅞ per cent in Iraq Petroleum Co., Ltd., and affiliated companies.

The company, jointly with Socony Mobil Oil Co., Inc., is owner of Standard-Vacuum Oil Co., which carries on producing, refining, and marketing in the Far East, Africa, and Australia. Stanvac produced 72,000 bbl. daily in 1955, chiefly from Indonesia.

Total refinery runs in 1955 averaged 2,271,000 bbl. daily, of which 34 per cent was processed in Latin America, and 21.5 per cent in the Eastern Hemisphere.

In Latin America, the leading refining subsidiaries were Lago Oil & Transport Co.,

Ltd., which processed 440,000 bbl. daily at Aruba, Netherlands West Indies, and Creole, which handled 229,000 bbl. daily at Amuay and Caripito refineries in Venezuela.

The company has interests in refineries in six countries in Europe, the largest of which is at Fawley, England, where runs were 143,000 bbl. daily in 1955. It also has interests in crude producing companies in France, West Germany, and the Netherlands.

Officers: E. Holman, chair.; M. J. Rathbone, pres.; vice presidents: J. E. Crane, L. W. Elliott, H. H. Hewetson, E. E. Soubry.

STANDARD-VACUUM OIL CO., 1000 Westchester Avenue, White Plains, N. Y.

• The company, jointly owned by Standard Oil Co. (N. J.) and Socony Mobil Oil Co., Inc., carries on integrated operations in about 50 countries and territories in Africa, the Far East, and Australasia.

Crude production in 1955, chiefly from Sumatra, Indonesia, averaged 72,000 bbl. daily. The company is engaged in exploration programs in Pakistan, India, British Somaliland, Australia, Indonesia, Papua, Netherlands New Guinea, and the Philippines.

Stanvac's refineries in Union of South Africa, Australia, Japan, Indonesia, and India have a total capacity of 180,000 bbl. daily.

Officers: L. V. Collings, chair.; H. F. Prioleau, pres.; vice presidents and directors, E. N. Leibacher, C. B. Marshall, H. W. McCobb.

TEIKOKU OIL CO., LTD., 317 Higashi-Okubo, 2-chome, Shinjuku-ku, Tokyo, Japan.

• A private Japanese-owned producing company. It handles about 98 per cent of domestic crude output, which in 1955 was 6,000 bbl. daily.

In 1955, the company turned over its exploration concessions to the newly formed Japan Petroleum Exploration Co. At the same time, the government relinquished its interest in Teikoku Oil. Teikoku in turn obtained 25 per cent interest in the new company. Teikoku now limits its activity to producing established fields and gas exploration.

Officers: Y. Aikawa, chair.; K. Kishimoto, pres.

THE TEXAS CO., 135 East 42nd Street, New York.

• The company, directly or through subsidiaries, is active in all phases of the industry in most of the free world, including exploration, production, transportation, refining, and marketing.

Its gross crude production averaged about 447,000 bbl. daily in 1955 in areas outside the United States and Canada, where output was about 426,000 bbl. daily.

Its total Latin American gross production in 1955, plus its share of output from nonsubsidiaries, was 87,800 bbl. daily. Chief source of this crude was the wholly owned Texas Petroleum Co., operating in Venezuela, Colombia, and Peru.

In Trinidad, the company had production through McColl-Frontenac Oil Co., Ltd., and in 1956 it purchased Trinidad Oil Co., Ltd., which produces 27,000 bbl. daily and operates an 80,000-bbl. daily refinery at Point-A-Pierre.

In the Middle East, the company has production through 30 per cent interest in Arabian American Oil Co., and 7 per cent interest in the Iranian consortium. It also has half interest in Bahrain production through joint ownership, with Standard Oil Co. of California, in the Caltex group.

The group's total production, from Bahrain, Indonesia, and New Guinea, averaged 93,200 bbl. daily in 1955.

The Texas Co.'s main interests in foreign refining are through the Caltex group which operates 13 wholly or partially owned refineries in nine countries of the Eastern Hemisphere. The plants' runs to stills in 1955 averaged 320,000 bbl. daily.

Officers: A. C. Long, chair.; J. W. Foley, pres.; R. F. Baker, exec. v.p.; M. Halpern, senior v.p.; H. T. Dodge, v.p. foreign operations, West. Hemis. and West Africa; A. N. Lilley, v.p., foreign operations, East. Hemis.

TEXAS GULF PRODUCING CO., 1347 Esperson Bldg., Houston.

• Holds 76 per cent interest in Ganso Azul. Cia. de Petroles, which has a concession over a total of 315,000 acres east of the Andes Mountains in Peru. At mid-1956, the subsidiary was producing 900 bbl. daily in Agua Caliente field from six flowing and 10 pumping wells. There were 560 proved acres in the field, located on a concession block of 74,100 acres. A 1,000-bbl. daily refinery is connected with the field. Other partners in the operation are Kendall Refining Co., Bradford, Pa., and Bay Refining Corp., Saginaw, Mich.

Texas Gulf also has a concession over 25,000,000 acres in six areas of Libya. A subsidiary, Libyan American Oil Co., was drilling a well in Cyrenaica late in 1956.

Officers: G. W. Reed, chair.; L. S. Reed, pres.

TOA NENRYO KOGYO, K.K., No. 4, 2-chome Otemachi, Chiyoda-ku, Tokyo, Japan.

• Operates a 42,000-bbl. daily refinery at Wakayama, and a 7,500-bbl. daily refinery at Shimizu, Japan. Standard-Vacuum Oil Co. has 55 per cent interest.

Officers: J. D. Davis, chair.; N. Nakahara, pres.

TRANS-ARABIAN PIPE LINE CO., 505 Park Avenue, New York.

• Operates a 30-31-in. pipeline which transports a portion of Saudi Arabian crude production to the Mediterranean Coast. The line extends 753 miles from Hafar al Batin pump station in Saudi Arabia, crosses small portions of Jordan and Syria, and terminates at Sidon, Lebanon. Deliveries the first 9 months of 1956 averaged 331,600 bbl. daily.

Tapline is owned by parent companies of Arabian American Oil Co. in the same proportion of interest.

Officers: C. A. Swigart, chair.; J. Noble, pres.; W. R. Chandler, exec. v.p.; H. O. Thompson, v.p.

TRINIDAD CENTRAL OILFIELDS, LTD., Capel House, 54, New Broad Street, London.

• A crude producer in Trinidad with 7,000 acres under lease. Output in 1955 averaged about 1,900 bbl. daily. Company also does some contract drilling for Trinidad Oil Co., Ltd.

Officers: J. E. Duckham, chair. and man. dir.

TRINIDAD PETROLEUM DEVELOPMENT CO., LTD., Kings House, 36-37, King St., Cheapside, London.

• A producing company in Trinidad with an output of about 10,000 bbl. daily from 73,789 acres. Company also holds offshore exploration license over 350 sq. miles off south and west coasts of Trinidad. British Petroleum Co., Ltd., offered to buy the firm in 1956 after the British Government prohibited a merger with Colorado Oil & Gas Corp. through a stock exchange.

Officers: H. A. Bennett, gen. mgr. in Trinidad.

TRINIDAD OIL CO., LTD., Trinidad House, 29-30 Old Burlington Street, London.

• The company, formerly Trinidad Leaseholds, Ltd., was purchased in 1956 by The Texas Co. for $176,000,000.

The firm has 138 acres under lease plus extensive offshore acreage. It produces 27,000 bbl. daily of crude and operates an 80,000-bbl. daily refinery at Pointe-a-Pierre.

The company markets in Trinidad, United Kingdom, and Eire through half interest in Regent Oil Co., Ltd. It carries on a refining and marketing operation in Canada through 90 per cent ownership in Regent Refining (Canada), Ltd.

Officers: S. J. Vos, chair.

TURKIYE PETROLLERI A. O. (Turkish Petroleum Corp.), Kizilay Istas Ap. Yenisehir, Ankara, Turkey.

• A Turkish company 51 per cent owned by the government. It is active in exploration, production, transportation, and refining in the domestic industry.

The corporation operates a 7,360-bbl. daily refinery at Batman, which is supplied by Garzan and Raman field. Output at mid-year 1956 was 6,500 bbl. daily.

VENEZUELA PETROLEUM CO., 600 Fifth Avenue, New York.

• The producing subsidiary in Venezuela of Sinclair Oil Corp. Output first 8 months of 1956 averaged 29,600 bbl. daily from concessions totaling 1,188,863 acres in four states. The company operates a 35,000-bbl. daily refinery at Puerto La Cruz.

Officers: H. M. Russell, pres.; I. J. Bergholt, v.p. and treas.; W. C. Paton, v.p.

YACIMIENTOS PETROLIFEROS FISCALES (Argentine), Avenida Roque Saenz Pena No. 777, Buenos Aires, Argentina.

• The company is the state oil agency of the Argentina Government. It handles most of the crude production and refining in the country. Crude output the first half of 1956 averaged 69,800 bbl. daily from Plaza Huincul, Mendoza, Comodoro Rivadavia, and Salta fields. Its refineries are located at Avellaned, La Plata, Lujan de Cuyo, Plaza Huincul, Comodoro Rivadavia, Salta, and San Lorenzo.

In 1956, Y.P.F. was made autonomous and given the responsibility for negotiating a $250,000,000 expansion program.

Officers: I. F. R. Ruiz, subadministrator.

YACIMIENTOS PETRLIFEROS FISCALES, Bolivianos, Casilla 401, Av. Camacho (Esquina Bueno), La Paz, Bolivia.

• The oil administration of the Bolivian Government. It operated the only active production in Bolivia the first half of 1956 when output averaged 8,500 bbl. daily. Y.P.F.B. also operates a 5,850-bbl.-daily refinery at Cochabamba, and a 3,000-bbl.-daily refinery at Sucre. It operates a 156-mile, 6-in. crude line from Camiri field to the Argentine border, and a 220-mile, 6-in. products line from Cochabamba to La Paz via Oruru.

Officers: I. E. Hinojosa Acha, gen. mgr.

C. C. Glenday, C. Dodd, and D. A. Minshall, construction staff view building progress as . . .

Kent Refinery Plans 52,000-Bbl. Expansion

Avgas capacity will fill gap in refinery pattern

A MAJOR expansion program is under way by BP Refinery (Kent) Ltd., at its Kent refinery, Isle of Grain, England.

- Capacity will be increased from the present 90,000 bbl. per day to 142,000 bbl. The scheme, which includes a 3,600-bbl. per day (133,000-ton per year) aviation-gasoline plant, is estimated to cost about $75,000,000 (£26,000,000) and is designed to raise the output of the full range of refinery products, including lubricating oils, to meet rising demand in the United Kingdom and Northwest Europe.
- The main items in the expansion program are to increase crude-processing capacity, and to build a plant for aviation-gasoline manufacture.

Kent Refinery Program

For crude-processing expansion there will be one 90,000-bbl. per stream day distillation unit; one 12,000-bbl. daily stabilizer; two 8,000-bbl. copper chloride treatment units; one 8,000 bbl. kerosine acid-washing unit. Product improvement will be obtained by two 10,000-bbl. Hydrofiners producing low-sulfur diesel oil. Associated hydrogen sulfide recovery and sulfur-production plants will have a capacity of 45 tons of sulfur a day. There will also be extensions to the oil and water-separation plant for purifying water discharged into the Medway.

Avgas plant . . . Associated with the aviation-gasoline production scheme will be the following: one 10,000-bbl. catalytic reformer, with provision for in situ regeneration of catalyst if required; one 12,000-bbl. thermal reformer; one 2,250-bbl. alkylation unit using sulfuric acid; one 500-bbl. Udex; one 900-bbl. isopentane unit—a single column 160 ft. high with ripple trays. Additional treatment plants and an acid-recovery unit will also be installed.

Ancillaries . . . The bulk of the refinery's production goes out by sea, and ancillaries will include two new jetties on the River Medway capable of berthing supertankers with incoming crude cargoes. There will also be about 500 miles of new pipelines; pumping facilities and extensions to services such as steam, cooling water, effluent disposal, and electric power. A considerable number of new storage tanks will be erected, and automatic tank welding machines will be used in their construction. Road and rail extensions are included in the program.

Foundation work is well in hand. The crude-expansion program is expected to be completed by the end of 1957, and the aviation-gasoline installation by spring of 1958.

Contractors . . . The following firms will be responsible for the engineering design and procurement of plant. Distillation unit, Idex, and acid washeries, E. B. Badger & Sons; reformers and Hydrofiners, Kellogg International Corp. (with Universal Oil Products Co. participating in the catalytic reformer); alkylation unit, Lummus Co.; stabilizer, Power Gas Corp.; solutizers and copper chloride units; W. J. Fraser & Co.; acid and sulfur-recovery plants, Simon Carves.

Joint contractors for the engineering of the offsite facilities are Power Gas Corp. and W. J. Fraser & Co. Design firm for the power station extensions is Parolle Electrical Plant Co., Ltd., and consulting engineers for the building of the jetties and all plant foundations are Rendel, Palmer, & Tritton.

Materials are being obtained mainly from United Kingdom sources, and

over-all construction supervision is by BP which has a resident construction manager.

Concurrent with the BP refinery expansion, the South Eastern Gas Board is building a large catalytic oil gasification plant adjacent to the refinery. Utilizing its own Segas process, the plant will make 18 million cubic feet of town gas a day, as a first stage, and will take some 70,000 tons a year of oil feed stock direct from the refinery by pipeline, together with the necessary utilities such as cooling water and steam.

The Economic Picture

The economic picture was outlined by BP's chairman, B. R. Jackson, in his 1955 report to stockholders. After commenting on the increase of world consumption of petroleum outside the Soviet sphere in 1955, Jackson recalled that various studies presented at the Geneva Conference on the Peaceful Uses of Atomic Energy, emphasized the gap which oil might be called upon to fill between the rapidly growing needs for energy in the Eastern Hemisphere and its available coal and other fuel supplies. Atomic energy was not expected to make any significant contribution towards filling the gap for some 10 to 15 years, and, especially in Europe, reliance would have to be placed on much greater use of oil.

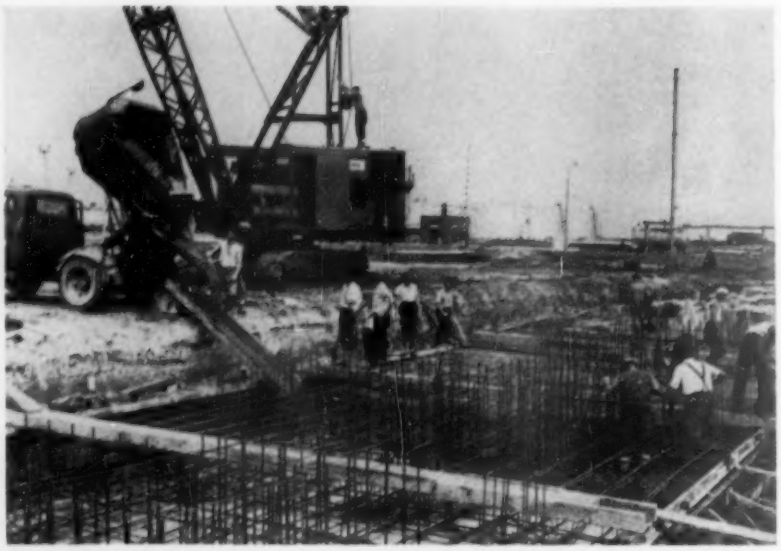
Increased fuel-oil demand . . . Jackson continued: "Not only will this call for progressively increasing quantities of oil (it is now estimated that the free world's requirements will rise to 1,400 million tons per annum by 1965) but it will tend further to distort the pattern of product demand. In 1955 even more than in 1953 and 1954 the trend was towards a disproportionately large growth in fuel-oil consumption, compared with other products.

"Although the tendency is observable in the Eastern Hemisphere generally, it is particularly strong in Europe, where over-all inland and bunker consumption of fuel oil was over 20 per cent higher than in 1954, whereas motor spirit showed an increase of under 10 per cent. The larger rate at which fuel-oil needs are increasing underlines once more the problem of keeping the balance, product by product, between market demand and what the refiner can extract from a barrel of crude oil in Eastern Hemisphere operations."

Date stepped up . . . The Kent project was planned originally to serve the United Kingdom market and to have export capacity to supply Northwest Europe. In the refinery layout provision was made for enlargement at the appropriate time, but the strong demand in Europe advanced the date of expansion, much more than could ever have been expected. Kent refinery is well situated on the route between BP's sources of crude-oil supply in the Persian Gulf and Iraq, and markets in Northwest Europe where the demand for oil is increasing so rapidly.

The supply of a wide area from a base refinery such as Kent, enables the out-of-balance requirements of individual markets to be combined to give a reasonable refinery pattern of production. This will be facilitated by the operation of the adjoining Segas plant, which can use a wide range of products down to heavy fuel oil and thus provide a high degree of flexibility by consuming whatever form of feed stock is most readily available from time to time.

The installation of aviation-gasoline capacity fills a gap in BP's refining pattern. Until 1951 the large aviation-gasoline plant at Abadan was fully available, but under the consortium agreement of 1954 BP could not rely upon more than 40 per cent of Iranian output of aviation gasoline. Despite the increased use of jet fuels, there will still be considerable demand for aviation gasoline for some time to come and Kent refinery is well placed for the manufacture of BP's requirements of this product, west of Suez.



PRODUCT IMPROVEMENT will be obtained by two 10,000-bbl. Hydrofiners, foundations of which are being poured here.

TWO NEW JETTIES will be able to berth supertankers with incoming cargoes of crude oil. Construction is shown here.

Operation "Anaco"

How Mid-Continent provides fast dependable oil field supply service in Eastern Venezuela

Oilmen in Venezuela are able to get supplies "off the shelf" at Mid-Continent Supply Company's Anaco store. In spite of one-to-three-month delivery problems, we carry complete stocks and offer the same around-the-clock Mid-Continent service.

To serve Eastern Venezuela customers, Mid-Continent maintains complete inventories at Anaco. Replacement stocks are ordered well in advance to assure continuous availability.

In Eastern Venezuela, as in other active oil areas of the world, you can depend on Mid-Continent Supply Company for sure service, sure supply. For Western Venezuela, Mid-Continent Supply Company maintains stocks of machinery repair parts at Maracaibo.

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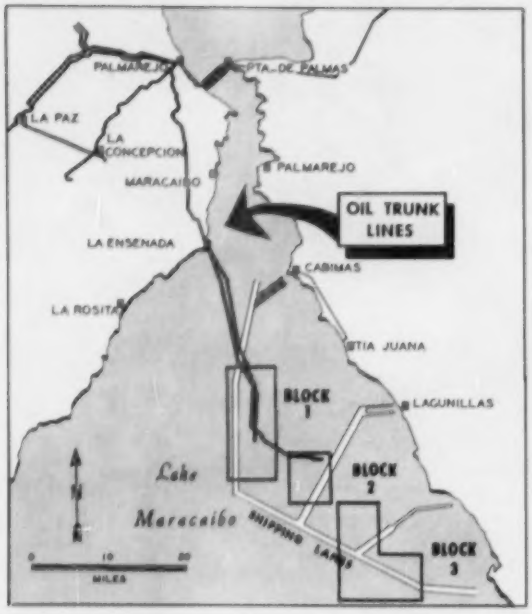
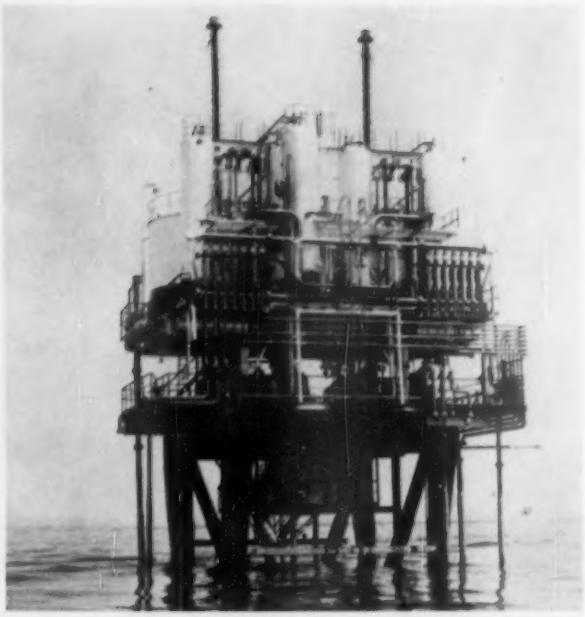
THE WORLD'S LARGEST INDEPENDENT OIL FIELD SUPPLY COMPANY



MARACAIBO'S DEEP WATER covers rich Miocene and Eocene oil-bearing sandstones. Oil outlets are Palmarejo and Cardon to the north.



PILE-SUPPORTED BLOCK STATIONS gather crude from wells for separation and testing. Pumps relay oil directly to main storage at Palmarejo.

Shell de Venezuela's score in Lake Maracaibo operations:

Over 100 Wells, 140,000+ Bbl. per Day

Operations are in 60-110 ft. of water, from permanent platforms

THE Compania Shell de Venezuela is actively developing three blocks of concessions situated in the northeastern part of Lake Maracaibo (see map). Additional concessions to the south and southeast of these blocks have been recently granted but drilling in them has not yet commenced.

VLA-1, the first C.S.V. well, was drilled by contract string and took 2 years to complete to 12,106 ft., at which depth it blew out from the Cretaceous, producing very large volumes of hot salt water. Drilling to Eocene objectives was started by the first C.S.V.-owned string in 1950 and a second string was introduced in 1953. Buildup of equipment then followed rapidly and, by early 1956, C.S.V. had six strings of tools in full service on the lake, served by seven drilling barges.

As an illustration of the mounting tempo of recent activities, 10 Shell lake wells were completed to the end of 1953, 23 to the end of 1954, but some 70 wells were completed in the next 18 months and VLA-100 (Shell's 100th lake well) was spudded in September 1956.

There was, necessarily, some time lag in provision of production facilities in the initial stages and, in early 1954, production averaged only about 3,000 bbl. per day which was disposed of temporarily by using small tanker hulks as main storage. When the first pipeline came into service in mid-1955 production rose to 55,000 bbl. per day and, by the summer of 1956, had reached some 140,000 bbl. per day.

Pay zones . . . Development activity has been concentrated mainly in Block 1 and the northern part of Block 2 with Block 3 still being principally in the exploration and appraisal phase.

Block 1 covers a large Eocene horst structure, bounded by roughly north-south trending fault zones with some additional minor crossfaulting, unconformably overlain by Miocene and younger sediments.

The bulk of the producing wells in Blocks 1 and 2 are completed in the Eocene, where a series of oil-bearing, lenticular sandstones occur. In addition, in some parts of Block 1, oil bearing sands of Miocene age are also found.

To date, the spacing of exploitation drilling has been confined largely to a 1,200-m. triangular grid for rapid appraisal. In those areas where it is proved necessary, follow-up drilling will be done later on a 600-m. grid. It is already evident that twin and triple wells will be required in some areas where the section contains several distinct productive sandstone groups.

Drilling Equipment

Due to the narrow outlet to the Caribbean and the large influx from rivers, the lake water is only brackish but nevertheless very corrosive (the chloride content in Block 1 is about 300 ppm. at the surface). While the lake is outside the hurricane belt the weather conditions are, at times, very severe and the area is subject to violent squalls which blow up quickly but, fortunately, are usually of short duration.

Water depths over the concessions

LAGUNILLAS CAMP houses most of company crews and fast motor launches which take them to work. Drilling tenders, production barges and tugs keep contact with camp by radio telephone. Remote controls being installed allow production and pipeline operations 15 to 25 miles to be continuously monitored.

vary between about 60 and 110 ft. and tidal effects are small. The lake bottom generally consists of about 30 to 80 ft. of unconsolidated silt, overlying a thin (5-10 ft.) harder sand streak. Below this 50 ft. of soft clay occurs before beds with good bearing characteristics are encountered. It is necessary, therefore, to drive foundations some 100 ft. below lake bottom.

Foundations and platforms . . . Wells are drilled from platforms mounted on permanent foundations which are left in position and provide working space and are designed to afford protection throughout the well's producing life. Most of the foundations used to date are made of steel with cement grouting, but trials using prestressed hollow concrete piles are being made. Platforms are now standardized as either 24 or 30 ft. square, being kept small to minimize the costly foundation work.

All tubular goods, mud chemicals, etc. are carried on the drilling tenders which are towed and maneuvered alongside by tugs. The tenders are maintained in position at the drilling platform by anchors, two forward and two aft. In rough weather the tender can be quickly backed away from the platform by slacking off the bow anchor chains and winching in the stern.

. . . A typical drilling platform for a development well is supported by four hollow steel 20-in.-diameter piles of ½-in. wall thickness. These piles are maintained in vertical alignment while being driven by means of a framework, or jacket, made up of four 30-in.-diameter steel guide tubes which are crossbraced to form a rigid rectangular structure.

The jacket is prefabricated and assembled on shore from a number of standard sections bolted together so that, when positioned on the lake bottom, the top of the jacket protrudes some 5 to 8 ft. above the water. The assembled jacket is transported to the well site by barge.

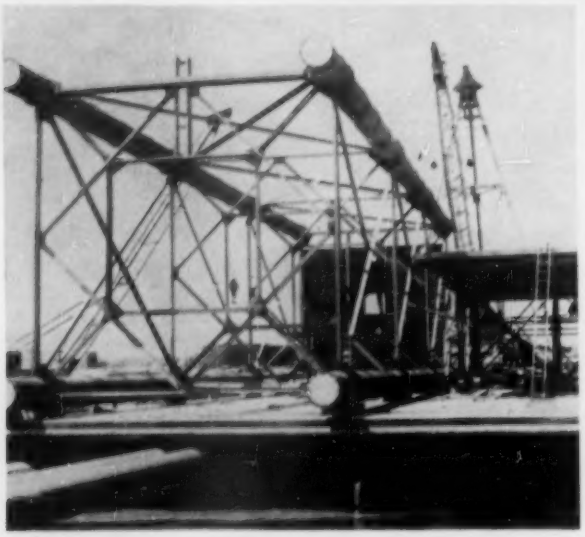
On site it is lifted from the barge by two cranes and lowered to rest on the lake floor. The steel piles are then placed in the guide tubes of the jacket and driven to refusal with a pile driver; the average penetration is about 100 ft. below the lake floor. Subsequently the tops of the piles are trimmed off above the water level, capped, and the permanent production floor welded to them.

Two conductor casing strings are driven at the center of the jacket; one of 30-in. to below the level of soft mud on the lake bottom but to a lesser depth than the piles, and the other of 20-in. to a greater depth than the piles in order to prevent washing out around the bottom when drilling commences. The annuli between the jacket tubes and the piles are grouted with cement.

For appraisal and exploration wells deeper than 8,500 ft., the larger 30-ft.-square platforms are required, which, in the past, entailed the use of special foundations incorporating eight additional raker piles driven diagonally at the corners to increase stability and load bearing capacity. This type of foundation is still placed for lake production block stations but for drilling purposes it has been superseded by simpler, four-pile foundations, utilizing 24-in.-diameter piles.

. . . The complete drilling platform, installed above the production floor, carries the derrick, derrick floor, rotary table, and control equipment for the blowout preventers. Additional space is

Here's how they erect, and operate from, permanent platforms . . .



Substructure on barge . . .

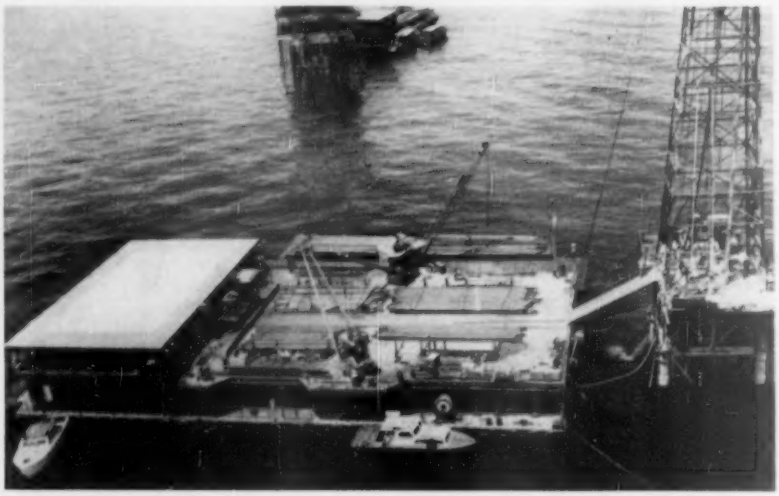
Is sunk to lake floor to guide piles . . .

gained by mounting the draw works and engines outboard of the platform on a cantilever section of the derrick floor. The production floor, which is a permanent installation, provides access to and working space for the blowout preventers and christmas tree, while the drilling floor is designed for removal after completion of the well.

Special platforms for twin wells at 24-ft. centers are also being introduced. These consist of two joined foundations supported by only six piles. The derrick is then skidded complete from one foundation to the other. Triple foundations are planned but none have been placed to date.

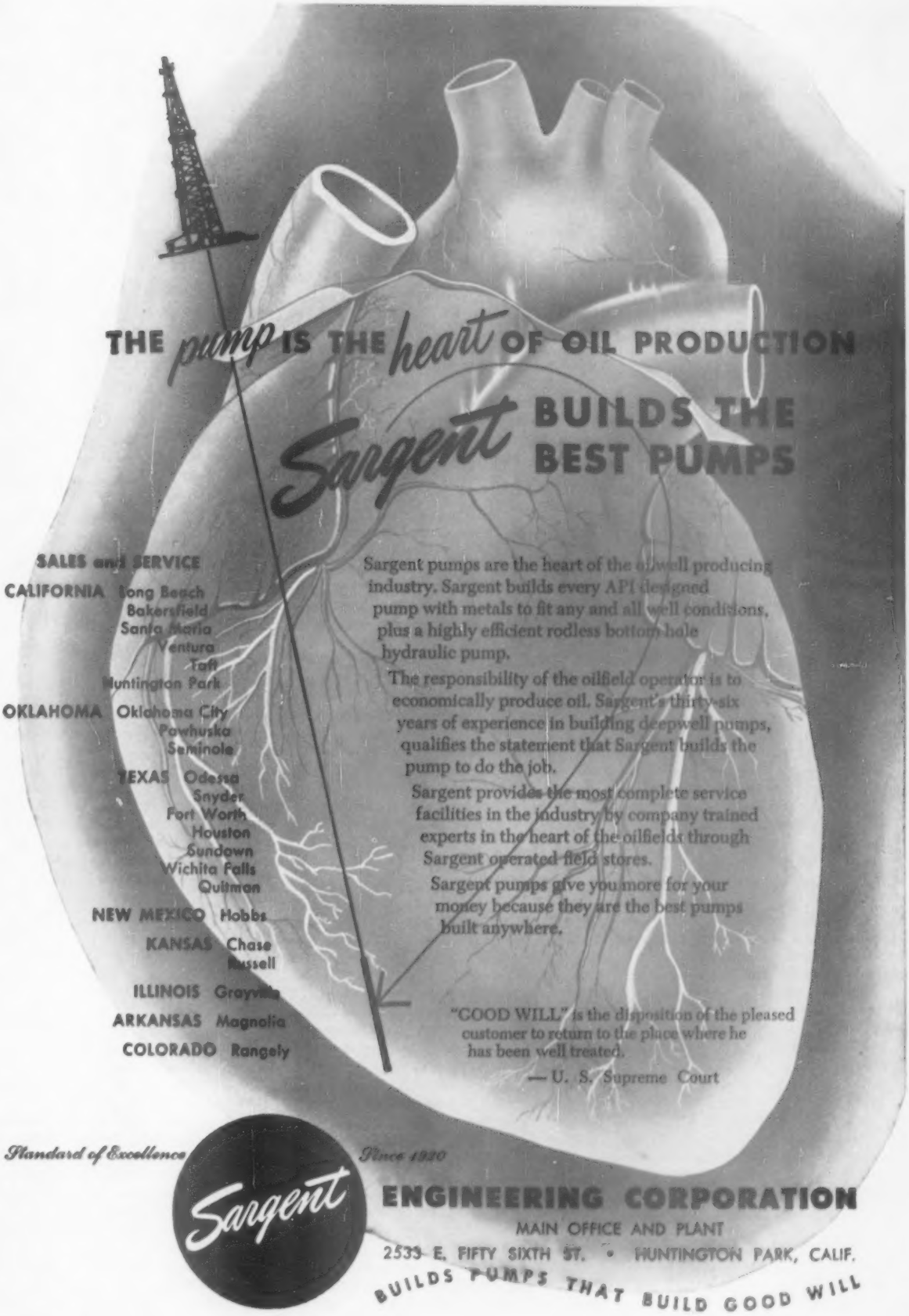
Tenders . . . Availability of equipment largely dictated the first types of drilling tenders and led to considerable variation in both design and method of power generation. Of the seven drilling tenders at present in service, two are steam-powered, one is diesel-electric and four are diesel-powered. However, from operating experience and studies of relative performance it now appears that a diesel-powered tender, some 160 ft. long by 80 ft. wide, with a draft of 8 ft., is best suited to this type of operation.

. . . A typical drilling tender consists of the hull and the upper and lower decks. The hull is divided into compartments, some of which are used as storage for fuel, fresh water and drilling mud. The mud circulating pumps are usually situated in a central well



Piles support drilling rig serviced by floating tender . . .

. . . production barge comes alongside to test completed well.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within the hull. The top of the hull forms the lower deck which carries the vibrating screens, sand-settling trap, ditches, and delivery lines of the mud-circulating system.

Space for storage of mud chemicals and weighing materials is provided and all mud testing and treatment is performed on this deck. The afterportion of the lower deck is taken up by the engine room or boiler battery. With the diesel and steam tenders the draw works and rotary table are driven by a diesel unit mounted on the drilling platform, but with the diesel-electric tender, all power necessary for drilling and operating is generated in the engine room. The remaining space on the lower deck is taken up by storerooms and dressing rooms for the crew.

Power-operated cranes with capacities of 3 tons each are usually mounted on either side of the upper deck for unloading and moving tubulars and other heavy items. Most of this deck is taken up by pipe racks sufficient to accommodate all the well tubulars but work areas are provided for drilling bits, fishing tools, sandline winch and service company tools. The radio cabin, office, and supervisor's accommodations equipped with limited cooking and sleeping facilities, are provided aft, below the raised helicopter-landing platform.

Access to the drilling floor is gained by means of an adjustable combination walkway and pipe ramp. Mud and power connections to the floor are of sufficient length to permit drilling to continue should weather conditions require the drilling tender to be moved back a short distance from the platform. However, all connections are designed to permit rapid uncoupling should the need arise to pull the tender away completely.

. . . Cementing operations are carried out by contractor, using a special barge which incorporates bulk storage for various classes of cement and facilities for blending, mixing, and pumping. For electrical logging and similar surveys, conventional truck-mounted equipment is transported from land on a flat-topped barge which is tied up alongside the drilling tender. However, this method is time consuming and unsatisfactory in rough weather and skid-mounted units, operated from the upper deck and moved from barge to tender as the need arises, are now being taken into service and are proving to be more satisfactory.

Development-Well Completion

The conductor strings are driven and the drilling platform rigged up before the drilling barge is moved in. A string of 10¾-in. casing is set at about 1,500 ft. in 14¾-in. hole and cemented to surface. At the same time, the annular space between the 30-in. and 20-in. conductor strings is cemented.

In a typical Eocene well 9⅝-in. hole is then drilled to total depth—usually around 7,000 to 7,500 ft. For drilling through the loose upper Miocene sands, lake water is used as drilling fluid and circulated back to the lake to avoid excessive sand cutting of the pumps. Thereafter a light clay-base mud of 75 lb. per cu. ft. is used for further drilling in the Miocene.

By the time the top Eocene is reached, the mud has been conditioned to a weight of 80 to 85 lb. per cu. ft., a Marsh-funnel viscosity of 70 seconds and a water loss of less than 5 cc. A.P.I. Mud control offers no special difficulties and the use of lake water does not call for any excessive chemical treatment.

Casing cementation . . . A 7-in. water-shutoff string, equipped with scratchers every 20 ft. and centralizers every 80 ft. over the Eocene section is cemented at total depth. The cement fill is designed to cover all prospective intervals and it is now normal practice to use low-weight slurries by premixing the cement with 12 per cent bentonite and 0.5 per cent lignosulfate. Satisfactory characteristics have been achieved with slurry weights as low as 90 lb. per cu. ft.

In Block 1 where the length of prospective section varies between, say, a few hundred feet and 4,000 ft., some variation in cementing techniques is involved. For example, where two separate prospective intervals exist, or an extremely long continuous fill is required, a stage collar is incorporated in the string and the job is carried out in two stages.

Completion . . . Development policy calls for wells to be completed on one productive sand group only. This may include several individual sandstone members and usually involves perforating intervals totaling some 100 to 200 ft. In the standard completion a retainer production packer is set in the casing above the highest prospective sand group, the tubing string run and latched on to the packer and the christmas tree installed. The well is circulated with water prior to shooting, thus reducing the pressure opposite the completion interval to some 400 psig. below formation pressure.

In the past most perforating jobs have been carried out using expendable aluminum carrier-type tubing guns at a density of four shots per foot. The length of gun employed seldom exceeds 40 ft. and, as the well is under pressure after the first perforation, all subsequent runs have to be made through a stuffing box and lubricator.

Difficulties have been experienced due to large gun fragments lodging in the 7-in. casing opposite the perforations but it is expected that this should be greatly reduced by the improved types of debris-free tubing guns which are now coming into service. A feature of the completion is that maximum safety is achieved by installing the christmas tree before the well is perforated.

Rate of production . . . Wells are normally completed flowing and are tested by connecting to a special production barge which is moored to the platform and equipped with full gaging and gas-measuring facilities. A well is produced into the test barge until clean production is confirmed (usually in a matter of a few hours only) and, after an initial steady rate is measured, both the production barge and drilling tender are released. The well is left closed in until the permanent flowline is connected.

A typical initial gage would be:

Production rate: 2,000 bbl. per day, on ½-in. (T) bean; G.O.R. 600 cu. ft. per barrel; T.H.P. 600 psig.; b.s. and w. 0.2 per cent; gravity 28° A.P.I.; duration of test 6 hours.

Total completion times for typical 7,000 to 7,300-ft. development wells average about 15 days per well.

The very high cost of full-scale barge operations on the lake makes permanent type of well completions, with their associated economies in future well-repair expenditures, an attractive proposition, and for this reason, tubing strings, when initially installed, are equipped with the full range of permanent well-completion "down the hole" equipment. By this means it should be possible to clean out sand fills in the casing, plug or squeeze off existing production intervals and carry out recompletions and other operations, using wire line, lightweight equipment only. In addition, provision is made for future gas lifting by installing a spread of mandrels fitted with dummy valves in the original string.

Safety controls . . . In the case of a producing well, the principal safety hazard is probably the heavy, round-the-clock shipping traffic. Though movement through the area is confined to well-marked channels, collisions with lake wells have not been unknown in the past. Consequently, the importance of reliable safety controls cannot be overemphasized.

Safety devices installed to date are all designed to close in a well if any damage occurs to either its flow line

or wellhead equipment. In the early wells, Otis down-the-hole tubing safety valves or "storm chokes," which actuate if the rate of flow through the valve is markedly increased, were installed. However, it soon became evident that, for the lake conditions, such valves were not the complete answer. The fine limits of accuracy required made calculation of the valve settings difficult, especially as conditions are likely to vary. Moreover, the narrow bore through the choke resulted in an excessive pressure drop with consequent production loss.

In conjunction with Otis, C.S.V. has introduced special surface-controlled safety devices and these have proved very satisfactory. They consist of wide-bore check valves installed below lake bottom at about 150 to 200 ft. below the derrick floor. They are kept open, thus permitting flow, by pressure from an independent pressure system installed at the surface.

High and low-pressure pilots are connected to the flow line and christmas tree, and, should pressure conditions in these surface connections depart from the normal operating range, the pressure maintaining the safety valve open is automatically discharged and the valve snaps shut.

To date the emphasis has been on safety valves for tubing flow. For gas lifting and for high-potential wells, where the tubing string may offer some restriction to flow, a safety valve which permits flow through the tubing and 7-in. casing annulus is under development. A trial field installation has already been made.

Oil Gathering and Disposal

The production gathering system in Block 1 is arranged on a basis of rectangular blocks of some 1½ by 2 miles, each containing 27 locations on the 600-meter grid. Flow lines of 6-in. diameter converge to the gathering station, placed at the center of the block.

The standard gathering station is mounted on a 12-pile foundation and consists of two main floors. The upper floor carries the gas separators, the manifold system, and two 1,000-bbl.-capacity tanks, one for bulk gaging and one for individual well testing. The use of special gaging separators has proved successful and these will be standard equipment in future stations. The lower floor is entirely occupied by the pumps and their motors.

All Block 1 stations will be electrified, power being supplied by two 34.5-kv. submarine cables from a power plant situated at Las Morochas some 13 miles away. The throughput capacity of each block station fitted with electrically driven pumps is about 25,000 bbl. per day. Station design is continually under review and marked improvements in capacity and layout are being achieved.

From the block station the crude oil is pumped away through 8-in.-diamter feeder lines. These tie into the main 16-in. gathering system which runs up the center of Block 1 and which also receives Block 2 production from an 8-in. connecting line. Riser platforms fitted with control valves and scraper traps are installed at major line intersections.

The 16-in. gathering system is tied into the main trunk lines, known as the "laplines," at the "lapline platform" in the north of Block 1. From here a dual line consisting of looped 16 and 20-in.-diameter lines runs 21 miles to La Ensenada on the northwestern shore of the lake. Thereafter a single 24-in.-diameter line 27 miles long, serves to transport the oil to main storage at Palmarejo de Mara, where fiscalization takes place.

The block-station pumps are of sufficient capacity to be able to pump to main storage all the oil presently produced. The capacity of the system is about 220,000 bbl. per day with maximum block-station pump pressures of 600 psig.

From main storage at Palmarejo, shipment is either by pipeline or tanker. The bulk of the production is pumped 155 miles on the Paraguaná Peninsula to Punta Cardon through the 30-in.-diameter "light-oil line" for transshipment overseas or refining. The balance is shipped overseas direct from Palmarejo. The blend of lake crudes from Blocks 1 and 2 is marketed as "Lagomar" and has an average gravity of about 30° A.P.I.

Corrosion . . . As mentioned earlier, the waters of Lake Maracaibo are extremely corrosive. The corrosiveness has been expressed as being between 6 and 10 times that of average sea water. Because of this, lines are laid on the lake floor in such a manner that they are never in contact with each other and all are protected by an impervious coating and wrapping. Lines of 10-in. diameter and greater are gunnited to achieve negative buoyancy.

In all lake platforms, to protect the foundation piles, the annular spaces between the guide tubes of the jackets and the piles are grouted with cement. In addition, cathodic protection will be provided for block stations, the lapline platform, riser platforms and all well conductor pipes. In those areas where direct-current power is not available, magnesium galvanic anodes will be used as a power source.

The installation of remote control equipment for production and disposal facilities is under way. When completed, this will provide systems to detect failures on the submarine sections of the lap lines, to indicate abnormal operational conditions in the block stations and to stop the block-station pumps in the case of a line break. Signals will be automatically transmitted by radio from the block stations to the production office on shore and simultaneously the pumps will be stopped. Restarting of the pumps will have to be done manually.

Supervision

Drilling and production operations are carried out on a three-shift basis with the administrative and technical establishments at the principal shore base in Lagunillas. Over-all supervision of operations and technical planning and control are centered in the Maracaibo office.

Crews and supervisory staff live mainly in company housing in the Lagunillas area. In addition, housing facilities for the crews working in Block 3 are provided in San Lorenzo, some 30 miles farther south. Transport of personnel to and from the drilling tenders and production facilities—distances ranging from 15 to 25 miles in each direction—is by high-speed 50-ft. motor launches which operate in any weather. Marine operations of this scope require a large and varied fleet of auxiliaries ranging from powerful tugs to pipe-laying barges.

For key supervisory and engineering personnel, a 24-hour helicopter service using two-seat machines is maintained from Lagunillas. Although this is rather more susceptible to the vagaries of the local weather conditions, traveltime to the farthest point of the concession is cut from about 90 to 20 minutes. All drilling tenders, production barges, and tugs are equipped with short-wave, two-way radio telephones which not only provide barge-to-barge communication, but also connect into the shore telephone system.

BOOK

SCIENCE AND ECONOMIC DEVELOPMENT. By Richard L. Meier. Published by John Wiley & Sons, Inc., 440 Fourth Avenue, New York 16. 266 pp. $6.00.

This imaginative work traces out new paths for economic development which are suggested and shaped by recent advances in science and technology. This is not another visionary effort to approach an economic and social utopia, but a hard-boiled assessment of what is likely to be feasible within the limits set by local and world resources.

The author draws on a wide variety of up-to-date sources to provide the reader with as realistic estimates of the costs of the new technologies projected here for underdeveloped areas as can be provided at present. A new understanding of the implications of world development will be given to the reader.

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EXPLORATORY WELLS (marked by triangles) were drilled in all parts of Australia during 1956, but success was nil. Geologists are studying the Cambrian as a likely reservoir for oil, however (inset map).

by
W. D. Mott
Consulting geologist,
Brisbane

Oil search down under still active, but rewards are few.

Cambrian Seen as Australia's Bright Hope

EXPLORATION in Australia since September 1955 showed a marked reaction to the lack of success during the previous year's activities.

The emphasis has been on surface and structural studies: 10 deep test wells were completed during the year and 10 were in progress in September 1956.

Gas in Papua . . . Important progress was made in Papua where Australasian Petroleum Co.'s 1 Keru found gas at 998 ft. and blew out, eventually cratering. It was killed with a directional relief hole. No official figures of flow were released but reports claim 50 M.M.c.f.d. of dry gas. The gas was found at the top of Miocene limestone section.

Cambrian Under Study

Considerable interest has been focused on the Cambrian as a possible source and reservoir sequence, as a result of investigations by Santos, Ltd., in the Pirie-Torrens basin of South Australia and reported gas and oil in a water bore near Ammaroo, Northern Territory. Hydrocarbons have been reported from Cambrian rocks in western Queensland and asphaltic from places in Northwest Australia.

Lithologically the Cambrian consists of limestone, dolomite, sandstone, and shale and has suffered no metamorphism in the areas of interest where folding is of a gentle nature.

Abundant fossil horizons occur in most of the exposed sections.

The accompanying illustration shows surface distribution of Cambrian rocks with a postulated area of deposition. In some areas the later Proterozoic sediments are difficult to distinguish from earliest Cambrian and it is possible that some of the former are included here.

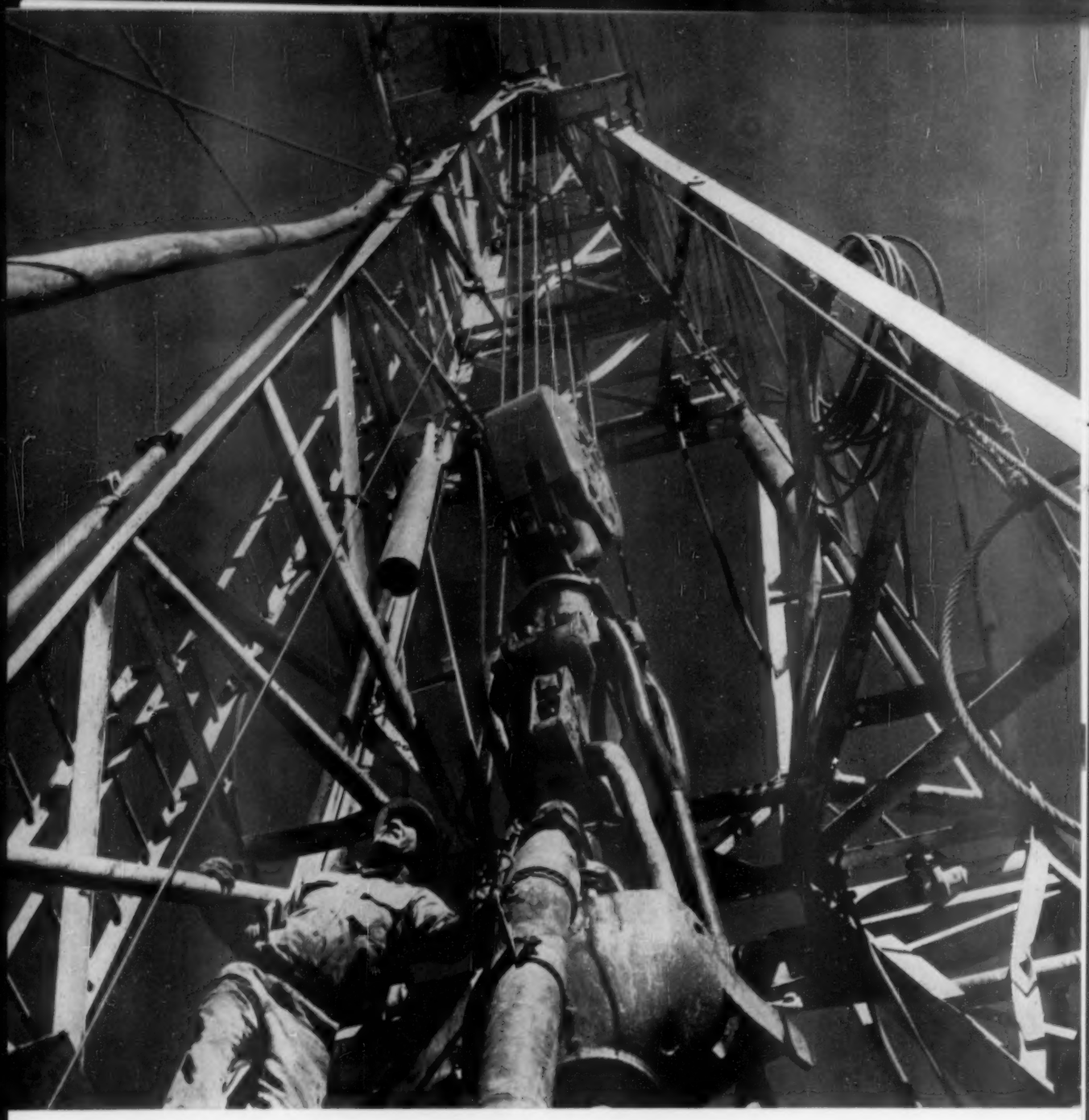
In Gippsland, Victoria, drilling at Woodside has shown oil in Tertiary beds across the basin, a distance of 90 miles from earlier discoveries. It also found, for the first time, oil in the Jurassic rocks of nonmarine origin. These findings support the geological opinion that underlying Paleozoic rocks are the true source of Gippsland's oil and encourage further efforts in the area. None of the showings has been tested to date.

Papua-New Guinea

Australasian Petroleum Co. and Island Exploration Co. operating jointly have continued geophysical and geological exploration in conjunction with the drilling program. Their next test site will be at Morehead in southwestern Papua.

Papuan Apinaipi Petroleum Co., Ltd., is exploring to the east of the Australasian Petroleum Co. areas and has recently increased capital and linked with Associated Australian Oilfields and Associated Freney Oil Fields, two companies which have been operating in Australia.

Enterprise of New Guinea, Gold &



Wire Rope at Work—Out on the plains of Kansas, the Shields Drilling Co. was making hole fast when this photograph was taken. Drilling had progressed to approximately 3000 ft, with an ultimate depth of 4200 ft in prospect. The rig in the picture was a veteran, one that had logged a lot of hole; it had drilled some 300,000 ft in a period of four years.

On this particular job, the rotary line was Bethlehem 1-in. 6x21 Seale, Purple Strand grade. It was the latest of several Bethlehem ropes, all of them excellent performers. Careful, detailed records showed an average of 16 wells per Bethlehem rope; or in terms of ft, 50,000 to 60,000 ft of hole drilled per rope. This is the sort of consistency that users like, and it is always particularly pleasing when costs are figured.

Bethlehem Steel Company, Bethlehem, Pa. On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

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World-Wide Oil

Petroleum Prospecting Co. is exploring an area in New Guinea. Scout drilling and a gravity survey are following geological mapping.

Western Australia

West Australian Petroleum Co. has carried on a very active geophysical and structure-drilling program together with deep tests in the Fitzroy, Canning, and Carnarvon basins.

Associated Freney Oil Fields completed one test in the Fitzroy basin and is proving another structure before deciding to test.

Fitzroy and Canning basins . . . The target of the Fitzroy basin has been Devonian and Ordovician rocks, which, where exposed on the northern margin, are reservoir and source rocks.

Deep drilling by West Australia Petroleum and Associated Freney out in the basin shows the presence of a thick Carboniferous wedge which depresses the target rocks to depths excessive for wildcat prospecting.

West Australia Petroleum is exploring the Canning basin.

Carnarvon basin . . . The Rough Range 1, Australia's discovery oil well, is located in this basin. On Rough Range structure eight tests proved dry and demonstrated the complexity of subsurface geology.

An intensive campaign of seismic survey and structural drilling has been conducted to assist interpretation. Faults now appear to control the accumulation.

Deep tests on Cape Range structure west from Rough Range penetrate a thick monotonous marine shale. The sequence shows frequent gas and oil signs but no porous beds have been found.

Four structural holes totaling 8,000 ft. were completed on the southern end of Rough Range and a fifth is in progress.

Approximately 11,000 ft. of structural drilling on Dirk Hartog Island has been completed.

Victoria

In Gippsland basin Frome-Broken Hill Pty., Ltd., completed a dry hole at 4,730 ft.

Four miles to the southwest, Woodside (Lakes Entrance) Oil Co. has drilled three holes to 6,000 ft. which will be deepened to penetrate the nonmarine Jurassic sequence.

Oil extracted from cuttings in these holes shows an increase in light fractions with depth. Presence of oil in the Jurassic is taken to mean migration from underlying source rocks.

Paleozoic rocks crop out to the north and small title holders are combining to investigate these rocks between Woodside and the margin of the basin.

New South Wales

Australian Oil & Gas Corp. exploring the Sydney basin is testing a structure at Dural and has entered Permian beneath Mesozoic rocks.

A stratigraphic hole is to be drilled near Yass in Lower Paleozoic sediments.

Queensland

Exploration was confined to the Carpentaria basin where geologic and gravity surveys were continued, and to portions of the Great Artesian basin and margins where aeromagnetics provided interesting results.

Several structures are to be tested early in 1957 under acreage agreement with Sun Oil Co. of California. Targets of these tests include Cretaceous, lower Permian, and Lower Mesozoic strata.

South Australia

Pirie-Torrens basin . . . Santos, Ltd., is exploring in Tertiary and Lower Cambrian sediments of a faulted basin running south from the margin of the Great Artesian basin.

Heavy crude has been found in fractured Cambrian dolomite beneath Tertiary sediments showing light-oil fractions.

Some 13 tests have been drilled in an area of 10 sq. miles, and similar geologic conditions extend for 100 miles northward.

The operators claim that the Cambrian offers source rocks as well as excellent reservoir characteristics. The deepest penetration is 2,000 ft. into the Cambrian. No reservoir pressure figures are available.

Murray River basin . . . Murray Basin Oil Syndicate and Australian Oil & Gas Corp. are drilling near the Victorian border.

Tertiary clastics were penetrated and showings of oil reported. At Loxton Cretaceous (?) was met at 1,550 ft. **End.**

Scoreboard on Aussie Exploration . . .

EXPLORATION IN VICTORIA

Gippsland basin:
Frome-Broken Hill, Pty., Ltd.:
1 Darriman, TD 4,730 ft., completed September 1955, Tertiary 4,110 ft; Jurassic.

Woodside (Lakes Entrance) Oil Co. N.L.:
1 Woodside, TD 6,008 ft., completed December 1955, Tertiary 4,000 ft.; Jurassic. Gas shows 2,539 ft.
2 Woodside, TD 6,100 ft., suspended April 1956, Tertiary 4,000 ft.; Jurassic. Oil shows 2,800 to 2,900 ft. paraffin-base oil in pre-Tertiary formations 5,120-5,290 ft. and 5,635-40 ft.; 6,100 ft. oil-bearing sands.
3 Woodside, TD 5,985 ft., completed July 1956.

EXPLORATION IN NEW SOUTH WALES

Sydney basin:
Australian Oil & Gas Corp.:
1 Dural, in progress.

Clarence River basin:
Clarence River Basin Oil Exploration Co. N.L.:
1 Grafton, TD 4,492 ft., suspended November 1955, Mesozoic (?). Evidence of hydrocarbons 2,800 and 3,540 ft.

EXPLORATION IN QUEENSLAND

Bowen syncline, Carpentaria basin:
Aust. Oil Exploration, Ltd.:
3 Reid's Dome, TD 4,437 ft., completed November 1955, middle and lower Permian.

EXPLORATION IN SOUTH AUSTRALIA

Pirie-Torrens basin:
Santos, Ltd.:
1 Wilkatana, in progress, Tertiary, Lower Cambrian.

EXPLORATION IN PAPUA-NEW GUINEA

Papua-New Guinea:
Island Exploration Co.:
1 Aramia, TD 6,628 ft., completed October 1955. No details available, 6,614-ft. basement. Slight evidence of oil and gas.
1 Barikewa, in progress, Miocene.

Australasian Petroleum Co.:
1 Kuru, TD 1,000 ft., abandoned. Gas at 998 ft.
2 Kuru, in progress, Miocene. Gas at 1,640 ft. in same formation and under same pressure as in No. 1.

EXPLORATION IN WESTERN AUSTRALIA

Fitzroy and Canning basins:
West Australian Petroleum:
1 Grant Range, TD 12,915 ft., completed October 1955, Permian 4,900 ft., Carboniferous (? Devonian). Small gas showing at 6,000 ft.
1 Fraser River, TD 10,144 ft., completed August 1956.
1 Roebuck Bay, TD 4,000 ft., completed September 1956.
1 Dampier Downs, in progress.

Associated Freney Oil Fields N.L.:
1 Myroodah, TD 6,000 ft., completed January 1956, Permian.

Carnarvon basin:
West Australian Petroleum:
2 Cape Range, TD 15,180 ft., completed January 1956, Tertiary, Cretaceous 3,585 ft., Jurassic. Gas 9,900 to 10,100 ft.
3A Cape Range, TD 3,737 ft., completed August 1956. Gas and oil detected at 3,634 ft. but test failed to reveal significant presence.
4 Cape Range, in progress.
9 Rough Range, TD 3,844, completed December 1955.

...One

BAKER

RETAINER PRODUCTION PACKER

PRODUCT NO. 415-D

SINGLE ZONE

PERMANENT-TYPE WELL COMPLETIONS

The Baker Retainer Production Packer has been used in nearly every production application, old or new, and promises to play an even greater role in future production applications.

Because it can also be used successfully as a squeeze tool, it is used in a variety of supplemental applications (such as testing, acidizing, formation fracturing, squeeze cementing, etc.) that might be required during the completion or work-over phase of a well. That is why the Baker Retainer Production Packer has been frequently referred to as the "universal" packer, because it is truly the *one* packer that can be used *for all* production and many supplemental applications.

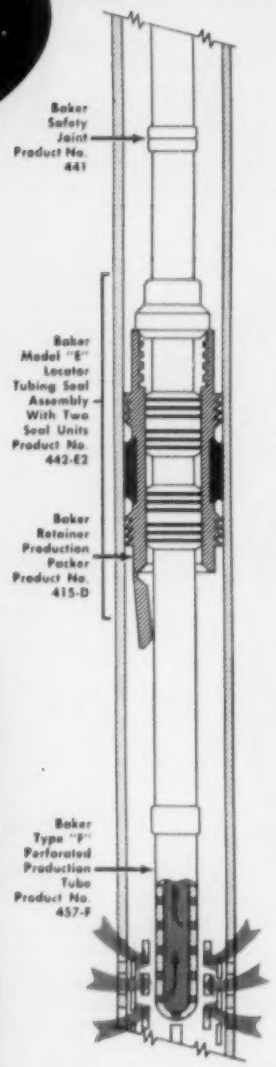
FEATURES

Can be run and set with the speed and accuracy of wire line, as well as on tubing or drill pipe.

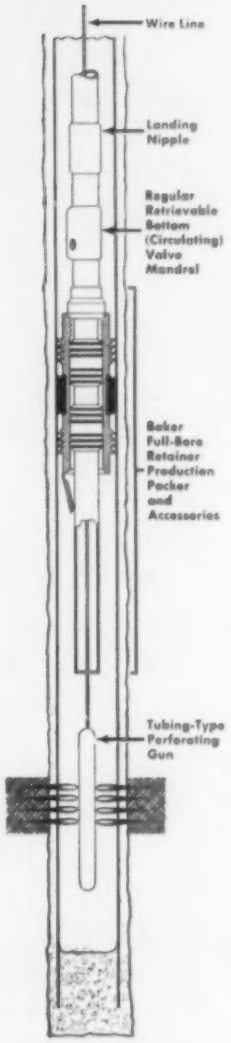
Holds any pressure from either above or below that is safe for the casing, even under temperatures in excess of 300°F.

Pack-off is independent of set-down weight or tension. Tubing string is free; just pick up (or unlatch and pick up) to remove it.

When tubing is removed, flapper valve closes to isolate zone below packer.


Baker Safety Joint Product No. 441
Baker Model "E" Locator Tubing Seal Assembly With Two Seal Units Product No. 442-E2
Baker Retainer Production Packer Product No. 415-D
Baker Type "F" Perforated Production Tube Product No. 457-F

Illustrates Packer set in casing with Locator Tubing Seal Assembly and Production Tube installed for single zone production.


Wire Line
Landing Nipple
Regular Retrievable Bottom (Circulating) Valve Mandrel
Baker Full-Bore Retainer Production Packer and Accessories
Tubing-Type Perforating Gun

Illustrates typical Permanent-Type Well Completion Hook-Up showing perforating operation through and below the Packer.

Baker Locator Tubing Seal Assembly Product No. 442-E2

Baker Retainer Production Packer Product No. 415-D

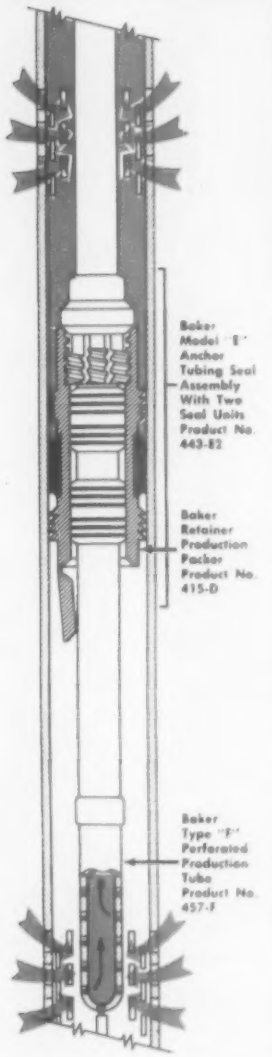
Successfully holds high pressures from above or below

...at shallow or record depths *even under temperatures in excess of 300°F.*

for all

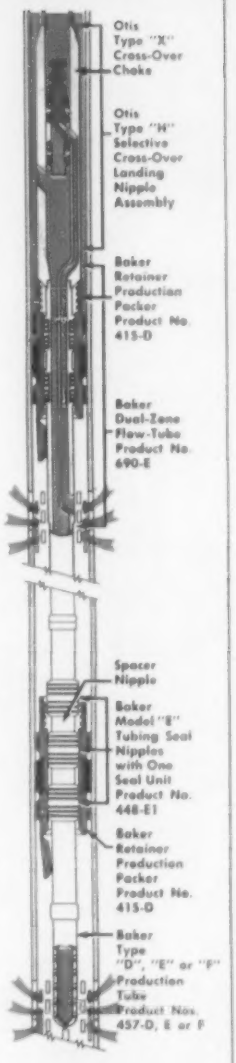
DUAL ZONE

SINGLE PACKER


Baker Model "E" Anchor Tubing Seal Assembly With Two Seal Units Product No. 443-82
Baker Retainer Production Packer Product No. 415-D
Baker Type "F" Perforated Production Tube Product No. 457-F

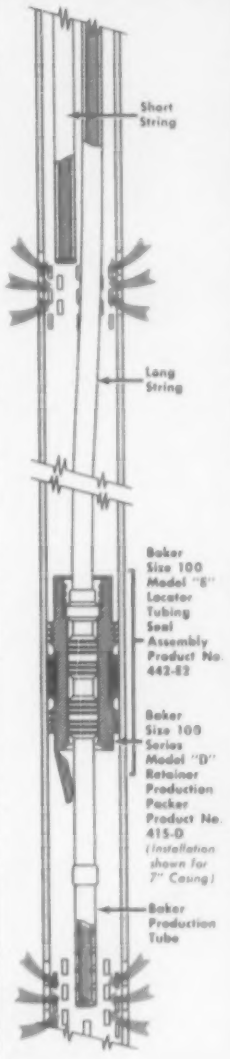
Illustrates Packer set in casing, with anchored production string for dual zone production. Tubing can be released from packer by rotating to right.

SELECTIVE CROSS-OVER


Otis Type "X" Cross-Over Choke
Otis Type "H" Selective Cross-Over Landing Nipple Assembly
Baker Retainer Production Packer Product No. 415-D
Baker Dual-Zone Flow-Tube Product No. 690-E
Spacer Nipple
Baker Model "E" Tubing Seal Nipples with One Seal Unit Product No. 448-E1
Baker Retainer Production Packer Product No. 415-D
Baker Type "D", "E" or "F" Production Tube Product Nos. 457-D, E or F

Illustrates selective two packer dual zone production hook-up (Baker-Otis) with Cross-over Choke installed. Flow pattern can be switched with Parallel Flow Choke.

PARALLEL STRING


Short String
Long String
Baker Size 100 Model "B" Locator Tubing Seal Assembly Product No. 442-82
Baker Size 100 Series Model "D" Retainer Production Packer Product No. 415-D (Installation shown for 7" Casing)
Baker Production Tube

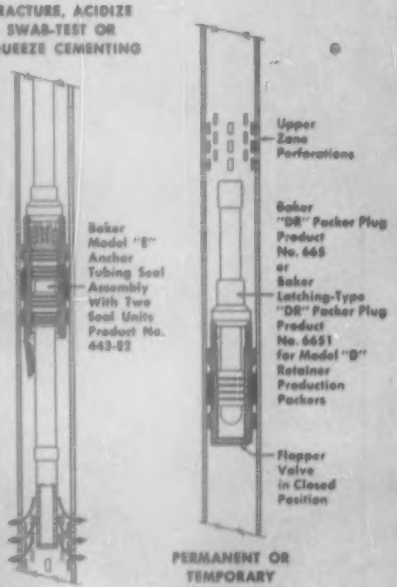
Illustrates simplest type of parallel string installation. Other installations involving two packers with full-opening tubing running through and below lower packer available.

SUPPLEMENTAL APPLICATIONS

WATER OR GAS INJECTION

The Baker Retainer Production Packer contains features that permit it to be used as a squeeze or testing tool as well as a temporary or permanent bridge plug. It is thus used in a variety of supplemental applications such as gas or water injection, testing, fracturing, acidizing, etc., that may be required either during the completion phase of a well or during a later phase.

FRACTURE, ACIDIZE SWAB-TEST OR SQUEEZE CEMENTING


Baker Model "E" Anchor Tubing Seal Assembly with Two Seal Units Product No. 443-82
Upper Zone Perforations
Baker "DR" Packer Plug Product No. 665 or Baker Latching-Type "DR" Packer Plug Product No. 6651 for Model "D" Retainer Production Packers
Flapper Valve in Closed Position

PERMANENT OR TEMPORARY BRIDGE PLUG

Send for complete information

A new 72 page catalog supplement is now available on the Baker Retainer Production Packer and its many features and applications. Write or ask your Baker Representative for Baker Catalog Supplement No. 502.

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OIL TOOLS, INC.
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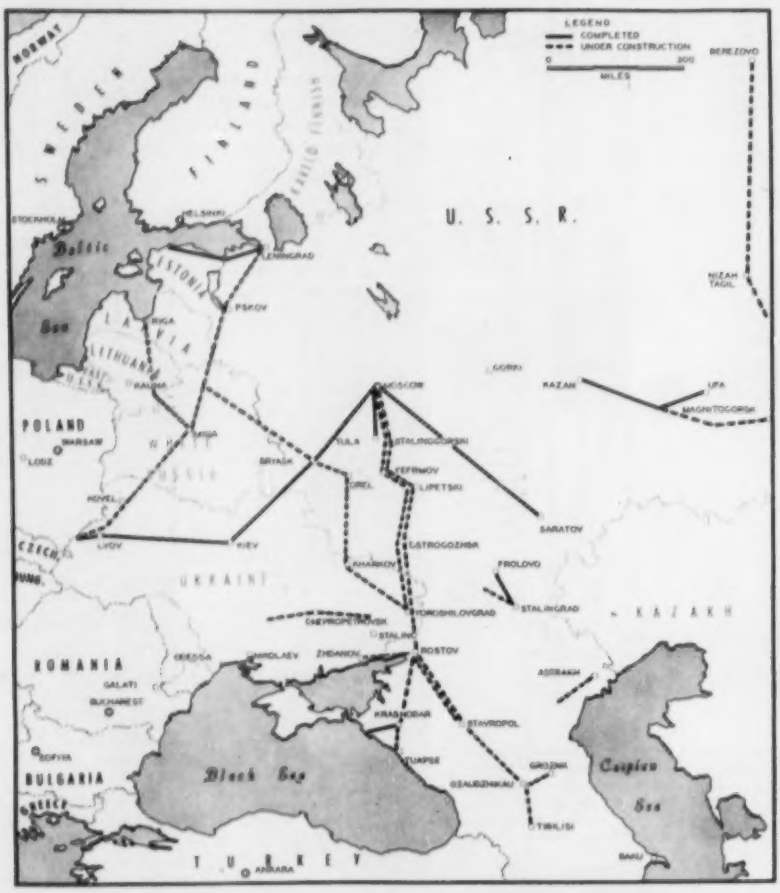
Pipeline Mileage Being Doubled



As Russia Strains to Expand Its Natural-Gas Industry

THE latest information on the Soviet's natural-gas industry comes from the U.S.S.R.'s Agricultural and Industrial Exposition located in the Ostankino suburb a few miles from downtown Moscow.

The foreign traveler can learn with ease the details of the industry from maps and other exhibits which report on recent progress and plans for the future. Compared to the oil industry, natural gas in Russia is in its infancy. The 300 billion cubic feet of natural gas transported annually in the country is less than the volume of some individual U. S. systems. Its major transmission lines total only 2,500 miles.

But although in its early stages, the natural-gas industry is making some progress and is now entering into a period of more rapid development. The 1956-1960 Five-Year Plan calls for doubling the pipeline mileage and boosting annual deliveries to 1.2 trillion cubic feet.

Natural gas is new . . . Prior to 1943, there were some supplies of natural gas used locally in the Georgian Republic (Baku-Tiflis), in Novorossisk on the shores of the Black Sea, and at Ufa near the Urals.

But most of the U.S.S.R.'s gas supplies were from artificial and manufactured sources. Moscow (8,000,000 population) was—and still is in part—supplied by manufactured gas in the city area. Leningrad (3,200,000 population) on the Baltic is still connected with a gas-manufacturing plant at Narva, about 75 miles away on the Estonian border, from which a line runs to Tallin, Estonia's capital, an additional distance of about 120 miles.

In the western region, byproduct residue gas from plants at Kuibyshev (about 550 miles east—and slightly south of Moscow, and temporary diplomatic capital during part of World War II) is sent to the industrial city of Buguruslan on the Volga.

Moscow lines built . . . Today, the U.S.S.R.'s natural-gas industry may really be said to have gotten its start early in World War II when adequate reserves of natural gas were discovered at Saratov, on the Volga, about 500 miles southeast of Moscow.

There a series of wells, which are now dually completed at about 3,500 and 4,500 ft., justified the construc-

by Henry F. Lippitt, II
New York and Washington, attorney

SECURITY QUALITY SHOWS...
after drilling two miles in Arbuckle lime!

Working for Frankfort Oil Company near Ardmore, Oklahoma, Riceland Corporation drilled 11,616 feet of hole in solid Arbuckle lime — a record depth in this hard rock formation. After comparing performance of the two biggest selling brands of rock bits used exclusively on this location, Riceland Toolpusher Page Arnall said:

"When bits were pulled, Security dulls looked better. Cones and bearings stood up better under this hard drilling — more insurance against fishing jobs."

To look better after coming out of the hole means this: Security bits *were* better before going into the hole. Better engineered . . . better designed . . . better built. Results on this, and hundreds of other locations, prove it! Here, each Security bit averaged four feet of hole more than competitive bits used — 53.7 feet compared with 49.7 feet.

Constantly alert for ways to cut costs, progressive contractors everywhere are switching to Security. Try Security rock bits on *your* next location. Prove to yourself that drilling costs drop when you *get Security in your drilling!*

Security
ENGINEERING DIVISION

Plants: Dallas, Texas • Whittier, California
Export Office: Chanin Bldg., New York, N. Y.

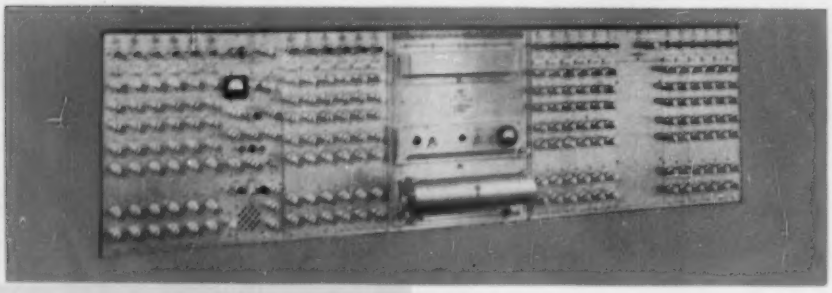
Write for 1956-1957 Catalog.

ROCK BITS • REAMERS • CASING SCRAPERS • RUBBER STABILIZERS

SIE

G-22A

SEISMOGRAPH SYSTEM



for high-production Operations

FREQUENCY RESPONSE: Within 3 db from 10 to 500 cps. Filtering as specified.

LOW DISTORTION: Less than 1% from 10 to 500 cps at 0.1 volt input.

AGC CONTROL RANGE: 0.5 microvolt to 0.1 volt input. (Three time-constants selected from front panel.)

GAIN CONTROL CIRCUITS: AGC, Expander, or simultaneous AGC-Expander operation.

RECORD PRESENTATION: Single record. Dual output. Dual record.

- First-Arrivals Unfiltered.
- Individual Channel Paralleling and Testing Switches.
- Simplified Controls.

Features essential to high-speed operation—available only on special order in many systems—are standard equipment in the G-22A.

New circuitry provides unmatched performance with all recording methods while simplifying matching and operating procedures.

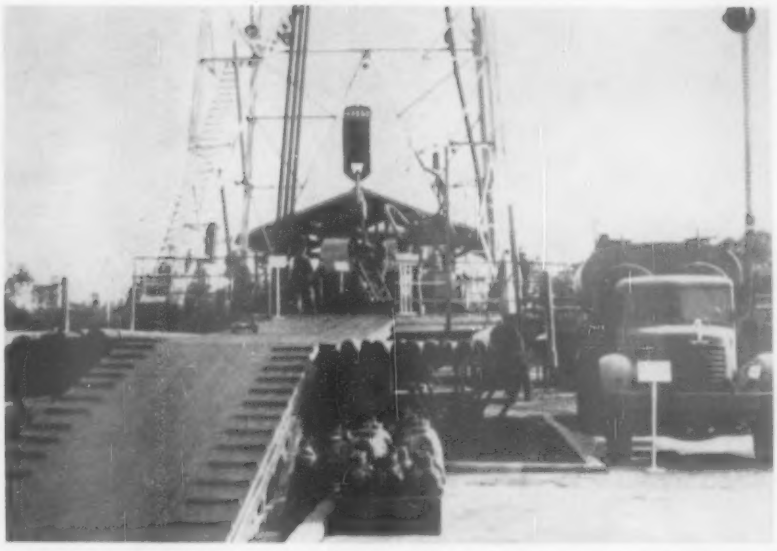
AGC Time-Constants, mixing method and percentage, and type of record presentation can be selected from the front panel. Two attenuation rates on both high and low cut filters provide hundreds of filtering combinations.

From the new self-biased AGC circuit to the simplified control panel, the G-22A's "field engineered" design combines practical operation with high flexibility.

227-56

SOUTHWESTERN INDUSTRIAL ELECTRONICS CO.

2831 Post Oak Rd.
P.O. Box 13058
Houston 19, Texas



SOVIET DRILLING RIG in model operation on exposition grounds. Note the apparently standard type of rig and platform, casing, pipe, and bits. The truck is a Zis, manufactured in Gorki.

tion of the first long-distance 12-in. line in 1943 to Moscow. It is still serving a substantial portion of the capital's needs at about 500-psig. pressure.

The principal addition to the Saratov-Moscow line came in 1951 when prolific gas fields were brought in at Dobromil, almost on the Polish border, about 60 miles west of Lvov in the Ukraine. In 1951 a 700-psig 20-in. line was constructed 350 miles to Kiev, the Ukrainian capital on the Dnieper River, and from there extended about 450 miles to Moscow, adding substantially to that city's supplies.

Other supply systems . . . Outside this present dual "right" and "left" arm natural-gas supply to Moscow, other isolated systems serve individual industrial areas. Natural-gas supplies at Krasnodar, about 60 miles back of the northeast shore of the Black Sea, are carried through a series of small lines to the four large cement plants at Novorossisk on the Black Sea.

Natural-gas supplies at Oktyabrsky, about 625 miles west of Moscow near the southern end of the Ural Mountains, are carried in a 12-in. line about 170 miles generally west to the manufacturing city of Kazan on the Volga. From there they are carried an additional 240 miles west to Gorki where an important part of the Soviet Union's autos, trucks, machine tools, and heavy equipment are manufactured.

In the other direction, the Oktyabrsky fields serve the city of Ufa in the foothills of the Urals. Two new 120-mile lines are presently planned to carry Oktyabrsky gas to Sterlitimak, and from there to Magnitogorski, the U.S.S.R.'s steel-making center in the southern part of the Ural range.

A small 75-mile line connects gas fields to Frolovo with Stalingrad, a manufacturing center on the Volga largely rebuilt since it was destroyed by the Germans in World War II. A supplementary source of natural gas is to be secured from Klemskaya, 65 miles away, for Stalingrad.

Behind the Urals, on the upper reaches of the Ob River, large supplies of gas have been recently discovered in the vicinity of Berezovo. A 625-mile, 8-in. line is under construction, to be completed this year, paralleling the Urals to take this natural gas south to Nizh Tagil and Sverdlovsk, one of the Soviet Union's new manufacturing centers behind the Urals.

Construction plans . . . The Soviet Union's recently promulgated Sixth Five-Year Plan, 1956-1960, is designed to increase the U.S.S.R.'s natural-gas production from 10.4 billion cubic meters (370 billion cubic feet) in 1955 to 40 billion cubic meters (1.4 trillion cubic feet). In order to do this, major new supplies in the Baku-Caspian area are to be carried to Moscow and a new line from the Polish border fields near Lvov is to be constructed to Leningrad.

The U.S.S.R.'s major new fields lie in the vicinity of Ordzonikidze (Dzaudzhikau) just north of the Caucasus range which runs diagonally between the Black and Caspian seas. Additional discoveries have been made in this general area at Grozny and at Stavropol, just across the Caucasus from the U.S.S.R.'s well-known Baku oil fields.

World-Wide Oil

From Ordzonikidze and Grozny a lateral is to cross the Caucasus (near mountains over 19,000 ft. in height) south about 85 miles to Tiflis, the capital, textile and manufacturing center of the Republic of Georgia.

The principal new 28-in., 700-psig. "backbone" line is to run about 1,000 miles north through Stavropol, Rostov-on-the-Don, Voronezh, on into Moscow. This line is to have five principal compressor stations near Ordzonikidze, Rostov, Novo-Pskov, Semiluki, and Schchekino. Each of the stations will have about 7,000 hp., powered by seven rotary turbine compressors of 1,000 hp. each.

Along the line the manufacturing centers of Kropotkin, Voroskilovgrad, Ostogozhsk, Yefremov, and Serpukhov are to be served from storage holders. This new backbone line also passes through the principal cities of Lipetsk and Stalingorsk. At the present time the line is nearing completion with two spreads at work in the Voronezh-Moscow section of the line, completion being expected within the year.

Loop for Moscow line . . . The Sixth Five-Year Plan calls for paralleling this backbone line from Stavropol to Moscow, about 800 miles, with another 28-in., 700-psig. line by 1960, picking up an additional supply of gas at Rostov from Krasnodar, 160 miles south, and a service lateral west from Rostov to Zhdanov on the Sea of Azov.

A crossover line is then planned from Voroshilovgrad to Kharkov, Orel, Briansk (on the present Kiev-Moscow line) to feed into the new Dobromil (Lvov) line from the Polish border to Leningrad and Kallin on the Baltic. The new 28-in., 700-psig. Dobromil-Leningrad line is to run about 900 miles to Minsk, the capital of Byelo-Russia, and from there to Pskov and Leningrad. A 250-mile Minsk-Riga lateral is to be built off of this line to Vilnyus, near the Lithuanian border, to Riga, Latvia's capital, on the Baltic.

In addition, other lines are planned to serve Kamyshin and Astrakhan on the Volga, Dnepropetrovsk on the Dnieper, and Kursk—from local nearby gas supplies within a 100-mile radius. An estimate of present installed lines is about 2,500 miles, ranging up to 12-20-in. sizes (300-500 mm.).

To this should be added about 1,500 miles within a year when the Stavropol-Moscow (28-in.) and Berezovo-Sverdlovsk (8-in.) lines are completed. Most of the principal new lines are 28-in., 750-psig. lines when deliveries warrant. The remainder of the Sixth Five-Year Plan calls for an additional 2,500 miles of line.

Safaniya's oil will flow to Ras Tanura through 22-in. pipeline put together in 80-ft. lengths

New Aramco Pipeline Will Put Biggest Offshore Field In Business

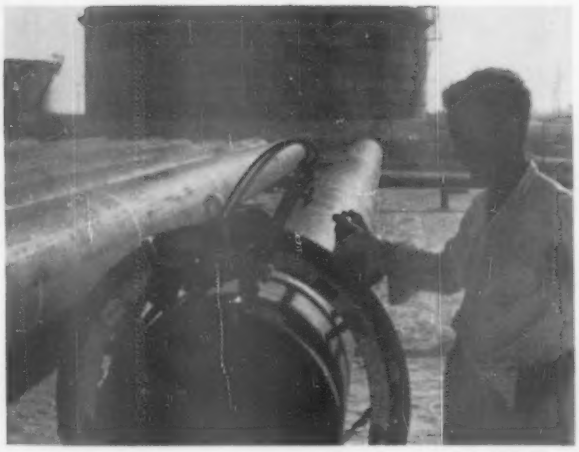
ARABIAN AMERICAN OIL CO. is building a new pipeline and other facilities for putting into production on April 1, 1957, the first offshore oil field to be developed in the Persian Gulf. This is Safaniya field, which was discovered in 1951. Its proved reserves are believed to exceed those of any offshore field yet found anywhere else in the world.

The field is approximately 20 miles long and 7½ miles wide, and extends at least 10 miles offshore. Some 69,300 acres are believed to be productive. There are two producing horizons, ranging between 5,000 and 5,600 ft. in depth. They are known as the Bahrain and Zubair zones. Theirs is the only Cretaceous production yet discovered by Aramco.

The program for putting the Safaniya field into production involves the construction of a 137-mile, 22-in. pipeline to link the wells, which have hitherto been shut in, with Aramco's refinery and tanker terminal at Ras Tanura. The pipeline is being constructed by International Bechtel Brothers, Inc., of San Francisco, at an estimated cost of $12,000,000. The total investment represented by the Safaniya project, including the cost of drilling wells, constructing tankage, and building related facilities, will amount to approximately $25,000,000 by the time the field goes into production.

Field hitherto shut in will be linked to Aramco's refinery and tanker terminal at Ras Tanura. Total investment will be some $25,000,000 by time field goes into production.

300-hp. trucks unload pipe at pipeline site in desert . . .



40-ft. sections are beveled for welding, then welded together at Ras Tanura yard

World-Wide Oil

Production target . . . Under this program, the necessary facilities for producing up to 50,000 bbl. per day of Safaniya crude are to be ready by next April. Additional facilities for producing up to 125,000 bbl. per day are scheduled for completion between 6 and 9 months later. These additional facilities represent an expansion of Aramco's original program, which had called for only the 50,000-bbl. daily target.

The expansion was in response to the world-wide demand for petroleum —specifically, fuel oil. The Safaniya crude has an A.P.I. gravity of approximately 27°. As such, it is heavier than other Aramco crudes. Its content of fuel oil, for which the Western European demand has been growing, is in the neighborhood of 65 to 70 per cent.

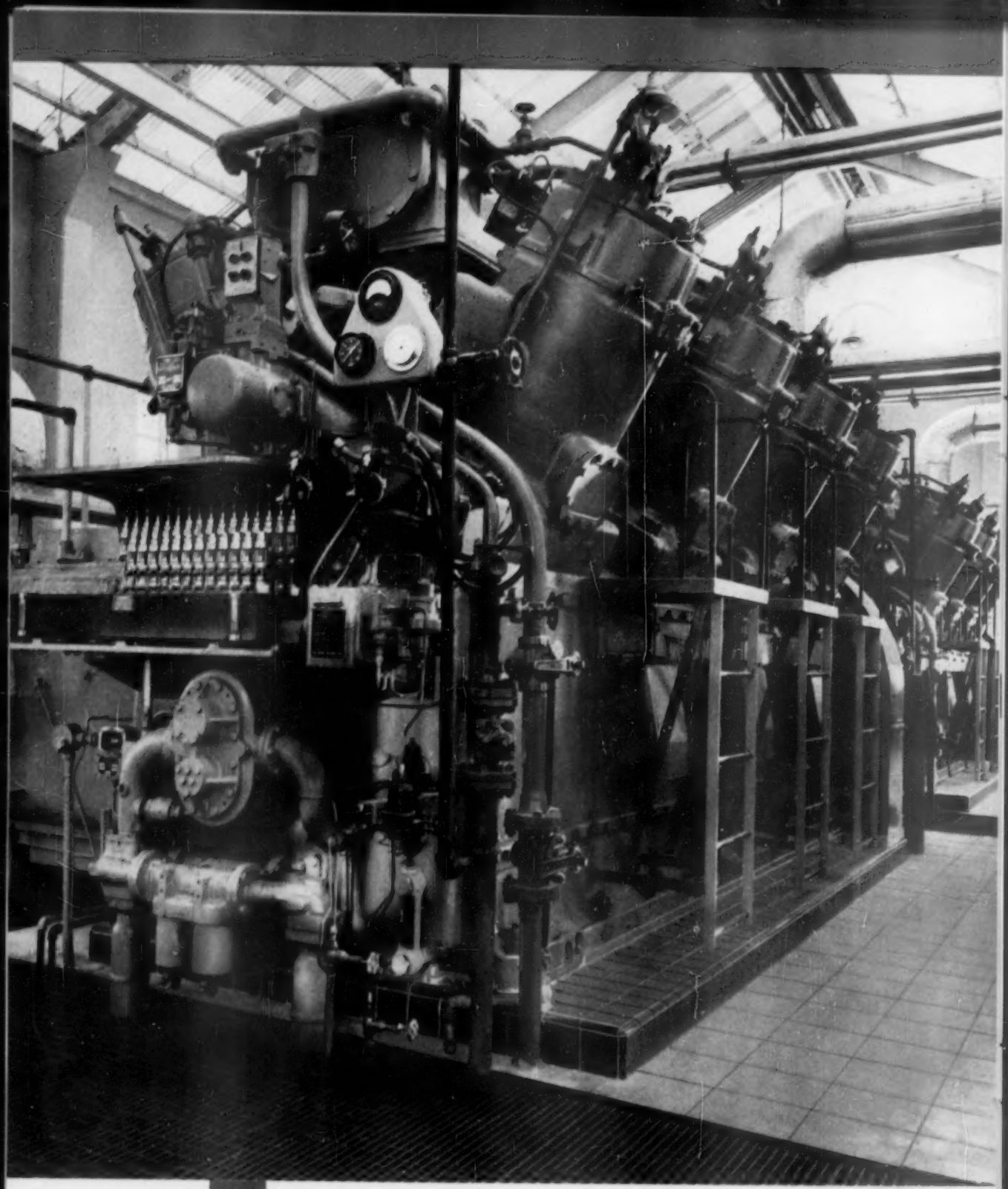
The 125,000-bbl. per day production which will be made possible by the Safaniya program represents the equivalent of more than one-tenth of Aramco's 1956 production. The company's production during the first 8 months of this year averaged more than 1,040,000 bbl. per day. A new record of 1,121,298 bbl. per day was set in May 1956.

Aramco is owned jointly by Standard Oil Co. of California, The Texas Co., and Standard Oil Co. (N. J.), each of which has 30 per cent shares, and by Socony Mobil Oil Co., which has a 10 per cent share.

Construction program . . . Putting Safaniya field into production involves the construction of: 8-in. underwater flow lines to between 13 and 17 wells; a 16-in. gathering line down the center of the oval-shaped field; a gas-oil separator plant on the Saudi Arabian mainland nearby; the 137-mile, 22-in. trunk line from the gas-oil separator plant to Ras Tanura; three new 180,000-bbl. storage tanks at the refinery; and three other storage tanks of that size at the terminal. This layout will make it possible either to process the Safaniya production at the refinery or to export it as crude.

To facilitate the construction of the trunk line, two 40-ft. lengths are welded into 80-ft. lengths at the Ras Tanura pipe yard and are then hauled to the

Pile driver rams piles into ground and support for elevated line is leveled . . .



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MOUNT VERNON, OHIO • GROVE CITY, PENNA.

COOPER-BESSEMER COMPRESSORS

FOR PETROLEOS MEXICANOS

. . . extreme dependability
. . . extremely economical

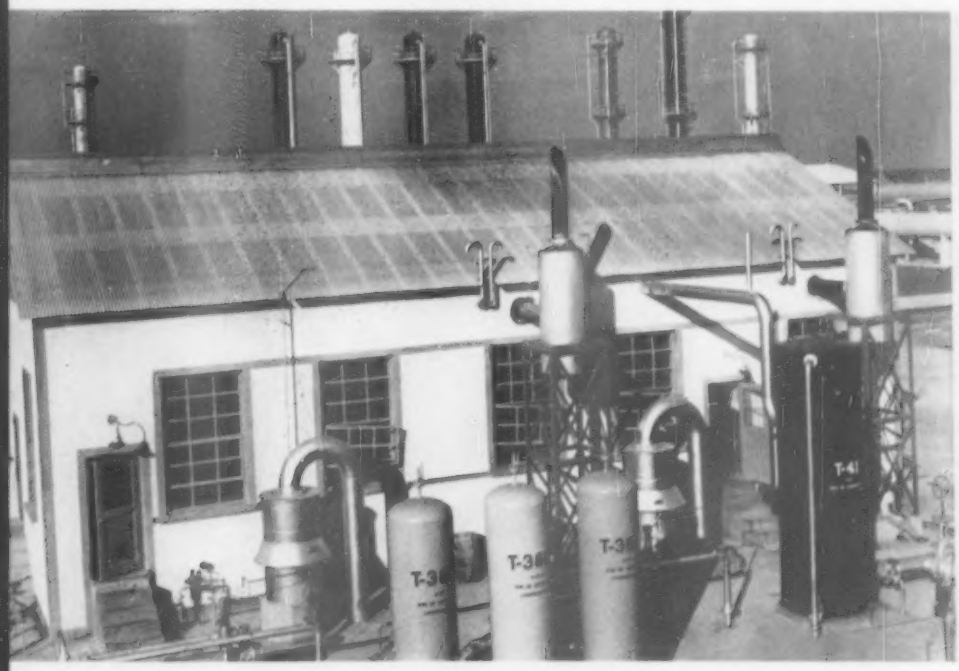
● The compression of natural gas and propane in Petroleos Mexicanos' gasoline plant, Reynosa, Tamps., Mexico, is a perfect example of extremes . . . all good!

Handling three pressure ranges, and handling them reliably and at low cost, is a brief summation of the Cooper-Bessemer performance story in this modern station.

Two 8-cylinder Cooper-Bessemer compressors handle plant process gas as well as compressing gas for distribution in northeast areas of Mexico and for export.

Known not only for performance . . . the name Cooper-Bessemer means cooperation and service all along the line. Detailed installation recommendations, experienced service engineers, availability and rapid delivery of spare parts from centrally located warehouses . . . each helps make your job easier, helps keep costs at a minimum.

Find out for yourself, next time plans call for compressors up to 6,000 hp, check with Cooper-Bessemer.



Another example of efficient compression at lower cost

Exterior view of the neat, compact Reynosa gasoline plant.

Petroleos Mexicanos' Reynosa station, showing 8-cylinder Cooper-Bessemer V-angle compressors.

ENGINES: GAS • DIESEL • GAS-DIESEL COMPRESSORS: RECIPROCATING AND CENTRIFUGAL, ENGINE OR MOTOR DRIVEN

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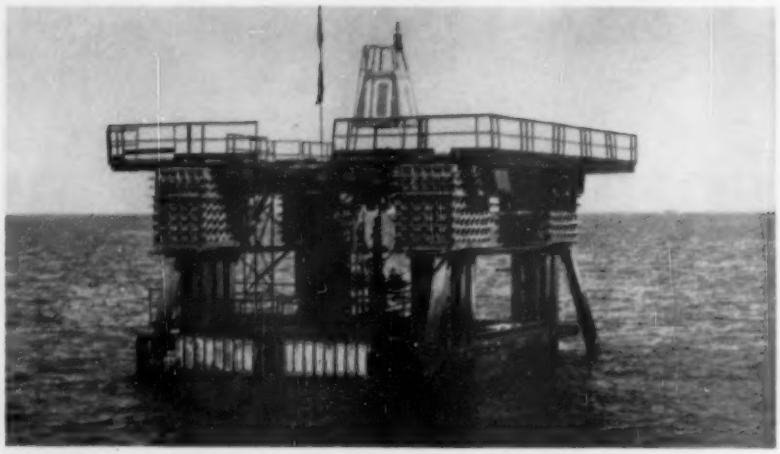
New Aramco Pipeline

Starts on page 182

The 8-in. underwater flow lines will hook 13 to 17 wells to a 16-in. gathering line down center of field



Offshore well is protected by platform and blinking light . . .

Crane on pipe-laying barge lifts pipe into welding position, and joints are wrapped

World-Wide Oil

right-of-way by 300-hp. trucks. The pipe has been purchased in Europe in accordance with Aramco policy. Because approximately 90 per cent of Aramco's production is sold in the Eastern Hemisphere, the company purchases its equipment and supplies there whenever it is feasible to do so.

Similarly the power for pumping the oil through the pipeline is to be provided by three British-made Ruston-Hornsby turbines. These gas-combustion turbines are being installed adjacent to the gas-oil separator plant. Although the original plans had called for the use of diesel pumps, the expansion of the production target caused the shift to turbines.

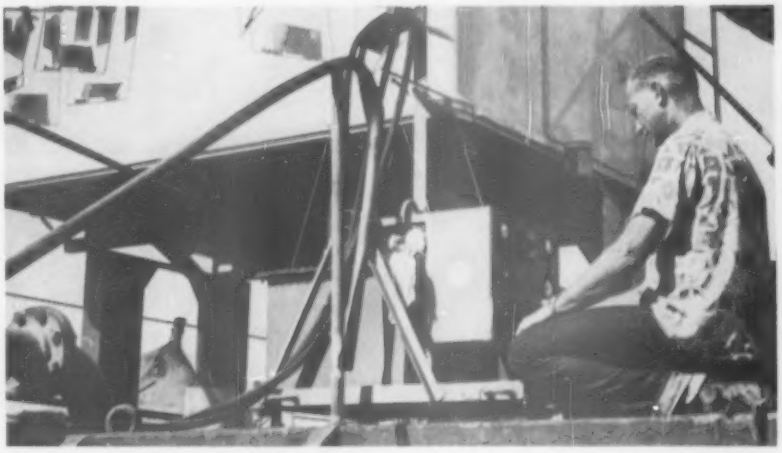
Drilling program . . . As part of its con-

Clamps holding pipe are loosened and pipe slides into water

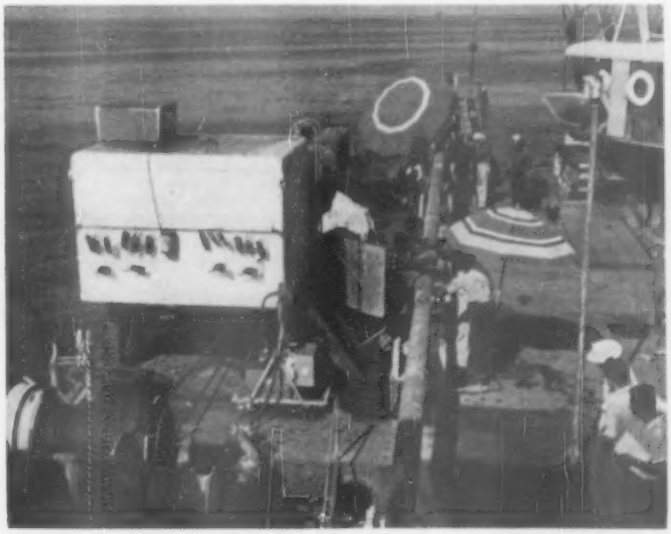
Flow line is coated with protective materials, topped by wire-reinforced cement

World-Wide Oil

tinuing program to develop Safaniya field, Aramco resumed drilling additional development wells there this fall. The drilling is being performed by a 174-ft. barge, known as the "Queen Mary," which has recently returned from overhaul in Bombay, India. Up to that time, 18 wells had been drilled on the Safaniya structure, 16 of them offshore and the other 2 on land. A typical drilling crew aboard the Queen Mary consists entirely of Saudi Arabs with the exception of an American supervisor. Aramco's policy is to train Saudis to participate as fully as possible in the development of Saudi Arabia's oil resources.



X-ray technician checks quality of each of the welded joints.

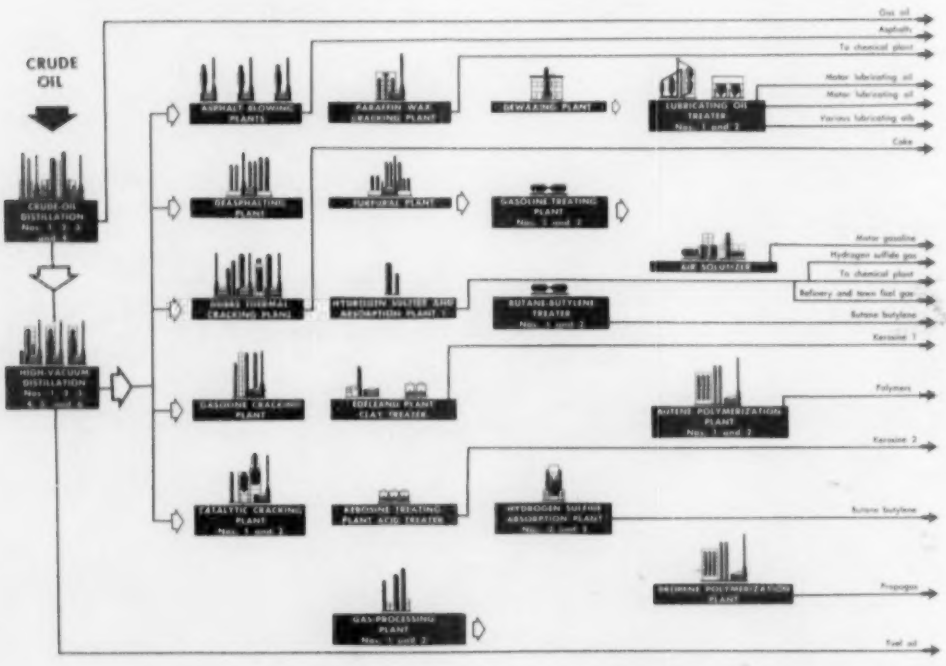


. . . and barge inches toward well in distance. Here is oil's terminal at Ras Tanura.

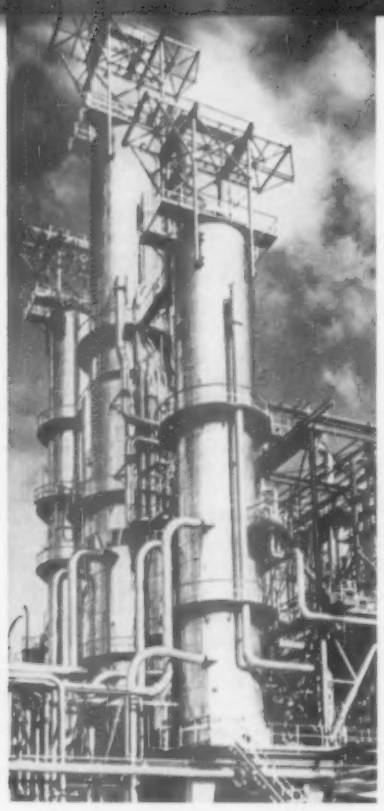
GENERAL VIEW of section of Pernis refinery taken during reconstruction in 1948.

Europe's Largest Refinery Continues Its

Pernis installation at Rotterdam also one of biggest



FLOW SHEET of the Shell installations at Rotterdam making up the Pernis refining-petrochemical complex.



CRUDE distilling unit No. 4 at Pernis.

Expansion

petrochemical producers

THE Netherlands occupies a unique position in western Europe's oil-processing and petrochemical industry. Geographically, it stands at the gateway to one of the most densely populated and highly industrialized areas in the world. Indeed, within a radius of 300 miles of Rotterdam, the major Dutch port, there are about 75 million inhabitants, almost equivalent to one-half of the population of the United States.

It is not surprising, therefore, that the refineries in the Netherlands operate primarily for foreign markets; nor is it surprising that the biggest oil refinery and petrochemical complex in Europe is at Pernis, 10 miles from Rotterdam, on the great Rotterdam Waterway. It belongs to the N. V. De Bataafsche Petroleum Maatschappiji (B.P.M.), the operating company of the Royal Dutch - Shell group, which at present has a throughput capacity of 12 million tons of crude oil per year.

Pernis Plant

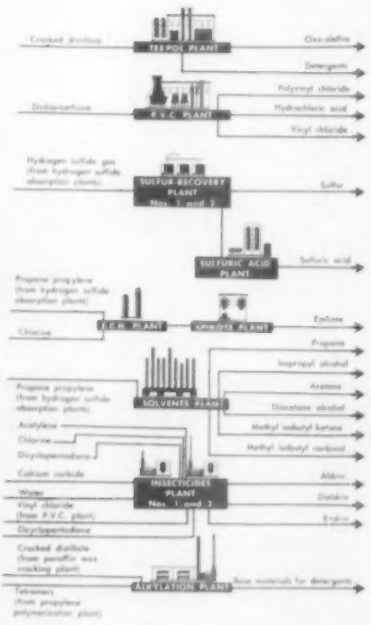
The Pernis installation has crude-oil distilling capacity of 220,000 bbl. per day; thermal cracking capacity 20,000 bbl. per day; cat cracking capacity 66,000 bbl. per day; and thermal reforming capacity 10,000 bbl. per day. Its crude intake in mid-1956 was 236,500 bbl. per day, and imported feed-stock intake, 6,500 bbl. per day. Crude oil comes by tankers mainly from the Middle East, and to a minor extent from Latin America. Also, around 850,000 tons of petroleum a year reach the refinery by rail from the domestic Schoonebeek oil field.

World-Wide Oil

Expansion . . . This Dutch refinery has behind it a remarkable history of expansion, especially since World War II. The ever-growing demand for oil necessitated storage and transshipment installations, whence the imported petroleum products could be forwarded to consuming centers. To such an installation, initially erected near Rotterdam by the Royal Dutch Petroleum Co. in 1902, was added a small refinery of 12,000 tons a year.

When the municipality of Rotterdam built a big new oil dock at Pernis, B.P.M. decided to construct there a modern refinery, with a tank farm and auxiliary plants. In 1936 a processing plant with an annual throughput capacity of 1 million tons of crude oil was in operation.

War damage . . . So great was the war damage and the dismantling of plants by occupation forces, that at one time it appeared doubtful whether the refinery could at all be rehabilitated. Only 2 of 300 storage tanks remained intact in May 1954. Yet, by August 1946, the prewar throughput capacity



CAT CRACKER at the Rotterdam-Pernis refinery, showing compressor house in foreground and regenerator and reactor in rear. Cat fractionator is at right background.

was exceeded, and by December of that year the prewar tank capacity was restored. Postwar extensions to the refinery were executed in four stages.

A new plant for crude-oil distillation, and another for high-vacuum distillation, a dewaxing unit and a thermal wax cracking plant were added. In September 1949 two petrochemical plants for producing synthetic detergents and polyvinyl chloride plastic, were commissioned.

Cat Cracking

The second phase of expansion comprised commissioning of the fluid cat cracker (the first in Europe) in November 1951; construction of a third crude-distillation unit; an installation for improving the quality of gasoline fractions; two high-vacuum distilling plants; a new plant for gas processing; as asphalt blowing plant; units for purifying gasoline and gases; new units for refining, blending and packing lube oils; and a new filling installation for liquefied gases, in addition to the extension of all auxiliary services for furnishing steam, water, electricity, air, and fuel. Additionally, workshops and stores underwent marked expansion; a new laboratory was built, and provisions for social welfare were improved and adapted to the substantial increase in personnel.

The third phase of the refinery expansion was begun in 1952 and partly completed in 1953. This included the fourth crude-distillation unit commissioned in 1955 with an annual throughput capacity exceeding 3 million tons —making it one of the largest in the world.

More recent extensions . . . These relate to the building of three plants for the preparation of high-grade engine lube oils. A kerosine-purifying plant was also completed, coupled with another asphalt blowing unit. Work was started on the second fluid cat cracker, and an Edeleanu unit for the refining of kerosine. The internal movement of packed products was modernized by automatizing the transportation of lube oil and asphalt drums from the filling plant to the shipment jetties.

Resins . . . In 1953 spring a plant for producing Epikote resins was commissioned. Later, the sulfur-producing unit was enlarged and modernized and a sulfuric acid installation was added. The construction of the epichlorohydrin (a base material for Epikote) plant was taken in hand; as also another unit for preparing allyl chloride (another base material for epichlorohydrin), both of which are now operating.

Other petrochemicals . . . Yet another group of units were built for the production of several solvents (alcohols and ketones) from the propene present in the cracked gases. Also, the plant for preparing the well-known insecticides — aldrin and dieldrin — is now functioning; whilst the endrin plant is scheduled to go on stream towards the end of 1956. Finally, the first synthetic glycerine plant in Europe—the only one outside the United States—at this refinery, is reckoned to be in operation towards the end of 1957.

Refinery

For the primary treatment of crude oil, the Pernis plant possesses four distillation units with a total daily capacity of 30,000 tons. The straightrun products obtained include: light and heavy gasoline, white spirit, kerosine, light and heavy gas oil and residue; whilst propane and butane are separated from the gases formed. Further treatment of the residue takes place either by high vacuum distillation, or the application of the cracking process.

The refinery has four high-vacuum distillation units from which gas oil and waxy distillates are obtained, leaving the heavy residue. Part of the latter is blended to fuel oil and another part processed to asphalt. The bulk of the distillates procured by high-vacuum distillation serves as base material for the cat cracker.

During processing the residue of certain crudes, base materials are obtained in one of the high-vacuum-distillation units for the production of lube oils. The wax resulting from the dewaxing process, the so-called slack wax, is cracked in the vapor phase in a specially designed thermal cracking unit, yielding a cracked distillate rich in unsaturated hydrocarbons, serving as base material for a detergent.

The two thermal cracking units have a total daily capacity of 3,000 tons. In one unit, the bulk of the residue is converted at high temperature and pressure into cracked gasoline and gases. In the other unit, cracking conditions are so chosen as to yield a solid residue—petroleum coke.

Another application of thermal cracking is found in the reforming plant, with a daily capacity of 1,300 tons, in which gasoline fractions with a low octane rating are converted into higher-grade products.

Cat cracking . . . In the fluid cat cracker, with a daily capacity of 5,500 tons, heavy distillates are cracked in the vapor phase with the aid of a catalyst, and gasoline with a very high octane rating is obtained. The catalyst used consists of a combination of aluminum and silicon oxides in the form of a finely divided, extremely porous powder, circulating through the plant in contact with gases as if it were a liquid. The process is fully continuous, as the catalyst is regenerated by air in the process itself and can therefore be recycled.

Gas processing . . . The gases formed in the various cracking processes are further treated in two gas-processing plants. Here the lighter gases are separated by absorption and distillation at high pressure from butane-butene and propane-propene liquefied under pressure. This is followed by their purification by the removal of sulfur compounds. The H_2S obtained is either marketed as such, or processed to elemental sulfur in a chemical plant.

Part of the purified lighter gases is delivered to the gas works of Rotterdam, The Hague, and a few other towns in South Holland, the rest being utilized in the refinery itself as fuel gas. Of the purified liquid petroleum gases, a part serves as base material for synthetic processes; the remainder is marketed as butane and propane for domestic and industrial purposes.

Pernis refinery also includes a number of purifying plants for gasoline, kerosine, etc., as well as a redistilling unit for the production of special boiling point spirits.

Petrochemicals

The first petrochemical plants at Pernis, accounting for the detergent and polyvinyl chloride plastic, were commissioned in 1949. The base material for the detergent is a distillate obtained by cracking paraffin wax. This, after treatment with sulfuric acid and alkali, is worked up into the finished product. It is supplied to the soap-making industry, among others, in the form of a liquid, in flakes, or as a powder, for processing into products for domestic use; it is also used in various other industries as a wetting agent.

Ethylene is the starting material for the manufacture of polyvinyl chloride plastic. With chlorine it forms dichloroethane. This intermediate product is converted into vinyl chloride, which, after polymerization, yields polyvinyl chloride.

Propane-propylene . . . In 1953-54 more petrochemical plants were added. Construction of a unit for the production of "epikote" resins was completed, together with a group of installations for the manufacture of various solvents. For the latter cracked gases from the refinery form the base material. The propane-propylene fraction is converted into isopropyl alcohol the base material for acetone. The lat-

ter is utilized as raw material for further syntheses, including alcohols and ketones, such as diacetone alcohol, methyl isobutyl ketone, and methyl isobutyl carbinol.

The building of a plant for epichlorohydrin (a base material for epikote) was taken in hand and another for manufacturing allyl chloride.

In addition to the units for producing the insecticides aldrin and dieldrin, a plant for manufacturing endrin is under way, together with another installation for the preparation of acetylene—one of the base materials for the production of insecticides.

It is nearly a decade since aldrin and dieldrin were discovered by Julius Hyman and associates at Denver, Colo., and the development of endrin ensued in 1951. In the following year the sole manufacturing rights of aldrin and dieldrin were acquired by the Royal Dutch-Shell group, since when the Shell companies have been carrying out a global program for their trial and development.

Aldrin, dieldrin, and endrin (all chlorinated hydrocarbons) are crystalline substances, insoluble in water but soluble in the normal organic solvents like acetone, benzene, and kerosine. In their synthesis use is made of the Diels-Alder reaction, named after two German winners of the Nobel prize, from which in turn, dieldrin and aldrin also take their names.

Sulfur Plant

The feed stock for producing sulfur is the hydrogen sulfide separated in the gas-purification plants. With bauxite as a catalyst, this gas is converted into elemental sulfur by partial oxidation in a Claus kiln. Part of this commodity is further processed to sulfuric acid in a separate unit for refinery use.

Glycerin . . . Work is under way on the first synthetic glycerol plant in Europe at Pernis—the only one outside the United States. It is scheduled to come into operation toward the end of 1957. Research carried out by Shell at Emeryville, Calif., led to the erection of an installation soon after World War II for the synthesis of glycerol from propylene.

The total area of the Pernis refinery, including the storage installation at Vlaardingen, is 1,000 acres, 750 acres of which are in use. Its total waterfront, including the tank farm, is 4 miles long. There are 24 jetties, 6 of which are for general cargoes, and 18 for liquid ones. At the latter, 10 of the largest tankers, with a deadweight capacity of up to 40,000 tons, can be handled at the same time. The refinery can take in 10,000 cu. m. of crude oil per hour and turn out a similar quantity of finished products. Its storage capacity amounts to around 2,400,000 cu. m., distributed over 850 tanks.

Daily consumption of the Pernis refinery is as follows:

Steam, tons	6,000
Cooling water, cu. m.	600,000
Electricity, kw.-hr.	450,000
Fuel oil, tons	1,000
Fuel gas, cu. m.	500,000

As a result of the considerable extensions during recent years a great demand for skilled personnel has arisen. Skilled workers have been drawn from all parts of the Netherlands, and to accommodate them over 600 houses have been built at Vlaardingen. Moreover, 850 houses, placed at the disposal of the company by the municipalities of Vlaardingen and Rotterdam, have been occupied by its employes. Normal operations of the Rotterdam-Pernis refinery, and the storage installation at Vlaardingen, provide work for around 4,000 workers.

Turning to latest developments, the second cat cracker (33,000 bbl. per day) was recently commissioned; and the cat reformer (12,700 bbl. per day), hydrodesulfurizer units I and II (16,400 and 7,800 bbl. per day, respectively) are scheduled to go on stream in the third quarter of 1957. Ancillary facilities are being stepped up accordingly.

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Pipeline deliveries change . . .
So must electric capacities .
Here's a blueprint showing . . .

How to Figure Your Power Needs

by A. E. Whiteside

Fig. 1—Map of Great Lakes Pipe Line system.

DELIVERIES from products-pipeline terminals are changing each year. And to meet these deliveries, adequately installed electric capacities must be maintained.

This report shows how the electric trend may be predicted from the trend of deliveries and how the electric capacities to meet the changing deliveries may be predicted from the electric trend. This is achieved through continuous electric power analysis. Some of the benefits to be derived are:

Author is with Great Lakes Pipe Line Co., Kansas City. Paper delivered at the A.I.E.E. Petroleum Industry Electrical Conference, Kansas City.

. . . **Economical use.**

. . . **Electric load** in relationship to installed electric capacities.

. . . **Maintaining electric capacities** to meet the predicted deliveries.

In maintaining continuous electric-power analysis, the electric bill from the power company is used as a starting point. Before 1948 the electric bills from the power companies were checked for mathematical correctness before paying the bill. The demand, energy, and cost were recorded and available for reference. Additional metering and equipment testing may be necessary to supplement the electric billing information.

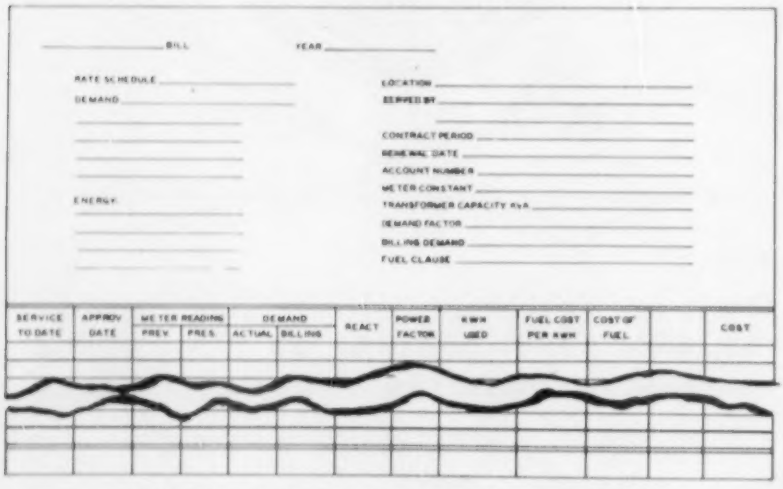

Fig. 2—Power book record page permits check of electric bill.

Data are included about the economics of the electric use, electric load in relationship to electric capacities, and product deliveries. The data are based on operations of Great Lakes Pipe Line Co.'s 15 products - pipeline terminals, which are shown on the system map (Fig. 1).

Electric Cost

Electric bill . . . The electric bills from the power companies are checked for mathematical correctness and necessary information is recorded in a power book.

Fig. 2 is an example of a record page from the power book. It includes all of the data necessary to mathematically check the monthly electric bill and covers a period of 1 year.

By having the record presented in this manner it is convenient to compare the present electric bill with previous bills at a glance. This check shows any abnormal changes in demand, power factor, energy, or cost. With the transformer capacity listed, a check of the transformer loading may also be made.

Electric rate . . . A study of the electric rate reveals a basic form:

$$\text{Cost} = (\text{demand charge}) + (\text{energy charge}) + (\text{customer charge}).$$

The actual rate may vary considerably from the above basic form. Of the 15 electric rates at the terminals, 2

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Table 1—Power Rate

ELECTRIC RATE—AS BILLED

DEMAND CHARGE:

$2.00 per month per kw. for the first 300 kw. of billing demand.
$1.80 per month per kw. for the next 300 kw. of billing demand.
$1.60 per month per kw. for all over 600 kw. of billing demand.

ENERGY CHARGE:

1.80¢ per kw.-hr. for the first 150 hours' use per month of the billing demand.
1.10¢ per kw.-hr. for the next 200 hours' use per month of the billing demand.
0.75¢ per kw.-hr. for all additional kw.-hr. used per month.

ABOVE ELECTRIC RATE REDUCED TO A BASIC FORM FOR SHORT-CUT CALCULATIONS

Use one equation based on demand and kw.-hr./kw.*

Demand—0 to 300 Kw.

Kw.-hr./kw.	Equation
0 to 150	Cost = 2.00 kw. + 0.0180 kw.-hr.
150 to 350	Cost = 3.05 kw. + 0.011 kw.-hr.
Over 350	Cost = 4.275 kw. + 0.0075 kw.-hr.

Demand—300 to 600 Kw.

Kw.-hr./kw.	Equation
0 to 150	Cost = 1.80 kw. + 0.0180 kw.-hr. + 60.00
150 to 350	Cost = 2.85 kw. + 0.011 kw.-hr. + 60.00
Over 350	Cost = 4.075 kw. + 0.0075 kw.-hr. + 60.00

Demand Over 600 Kw.

Kw.-hr./kw.	Equation
0 to 150	Cost = 1.60 kw. + 0.0180 kw.-hr. + 180.00
150 to 350	Cost = 2.65 kw. + 0.011 kw.-hr. + 180.00
Over 350	Cost = 3.875 kw. + 0.0075 kw.-hr. + 180.00

*To obtain per cent load factor, divide by 7.3.

Table 2—Example, Power Rate

Example—Power Rate Short-Cut Calculation

Billing from power company:
Demand—306 kw.
Energy—90,000 kw.
Cost—$1,922.10

To check the bill using short-cut calculation method proceed as follows:

1. Choose a group of equations based on demand. A demand of 306 kw. determines a group of three equations in the demand range of 300 to 600 kw.

2. Choose specific equation in the above demand group by dividing the kw.-hr. energy by the kw. demand:

$$\frac{\text{kw.-hr.}}{\text{kw.}} = \frac{90{,}000}{306} = 294$$

3. This determines the cost equation:

$$\text{Cost} = 2.85 \times \text{kw.} + 0.011 \times \text{kw.-hr.} + 60.00$$
$$\text{Cost} = 2.85 \times 306 + 0.011 \times 90{,}000 + 60.00$$
$$\text{Cost} = 872.10 + 990.00 + 60.00$$
$$\text{Cost} = \$1{,}922.10$$

4. It can be seen that the equation may be used on a calculator and no writing is necessary to check the bill.

are based on energy charge only and 13 are based on the demand and energy charge with customer charge in some cases.

The rate may be reduced to its basic form, between certain limits, for short-cut calculations if the number of times used warrants it. Tables 1 and 2 show an example of this method applied to an electric rate. As noted, one equation applies for a particular range of load and demand.

The National Electric Rate Book gives abstracts of rate schedules of electric utilities serving communities of 1,000 or more population. The scope also lists curves of different variations of the basic rate schedules.[1]

The cost per kilowatt-hour (kw.-hr.) gives a comparative check of energy costs. The electric metering at 7 of the 15 terminals includes main-line pumping stations. Three of the seven stations use electric-driven main-line pump units while the remaining four

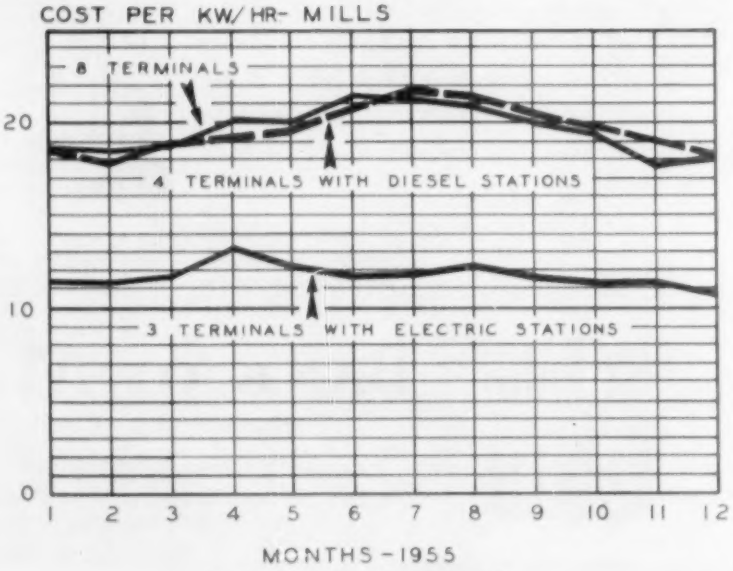

Fig. 3—Terminal cost per kilowatt-hour.

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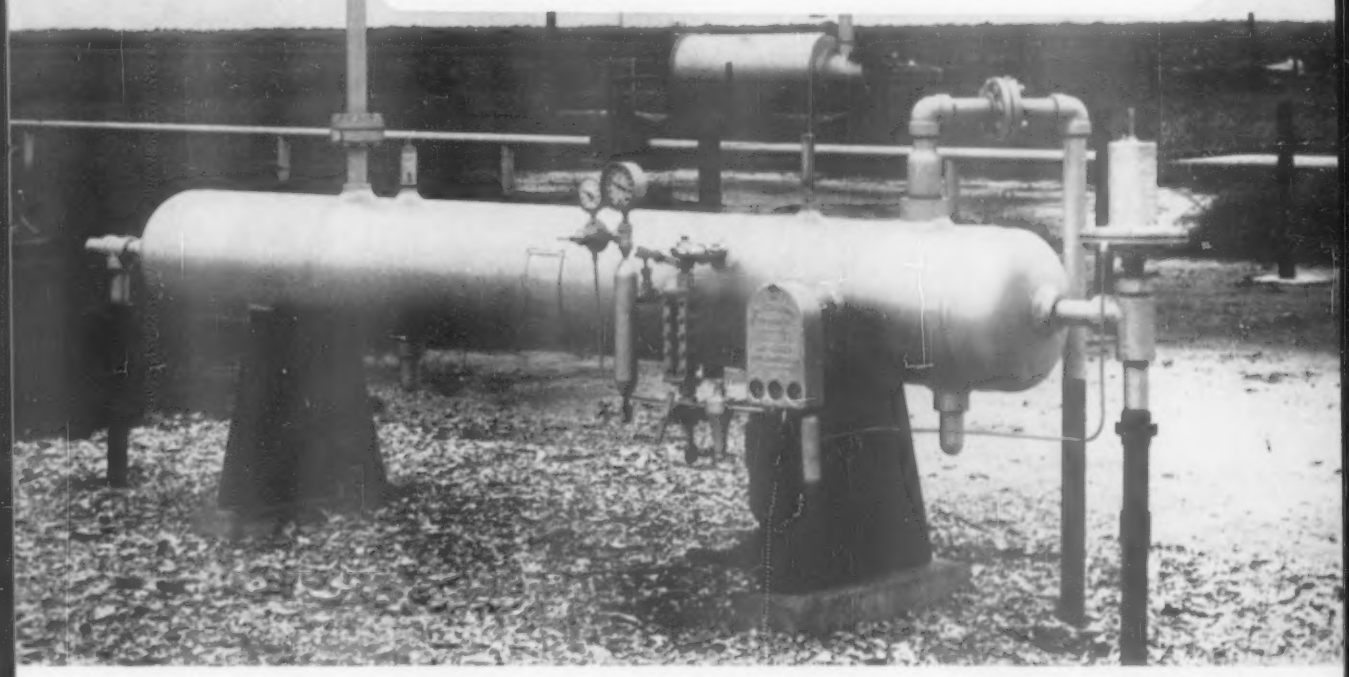

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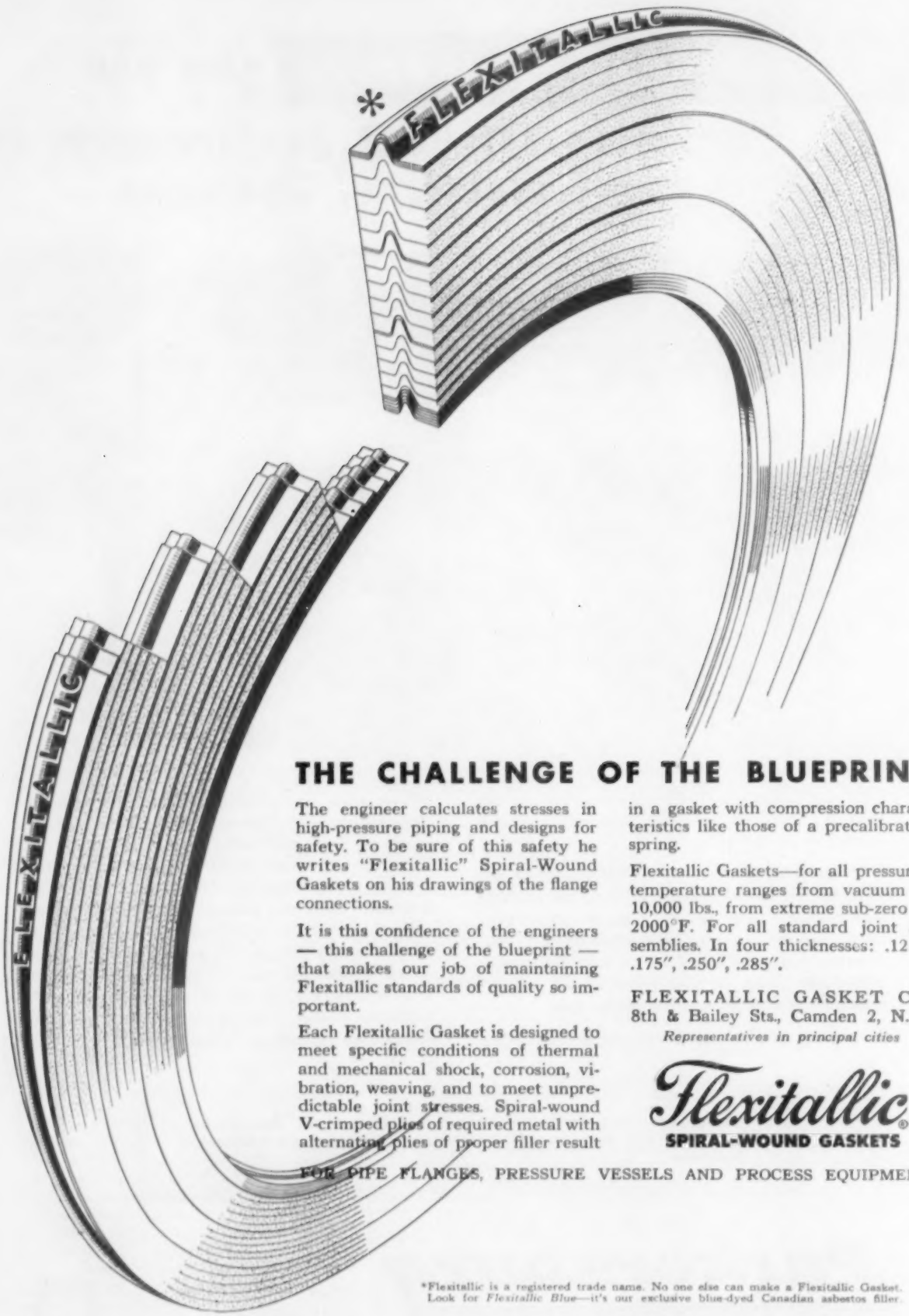

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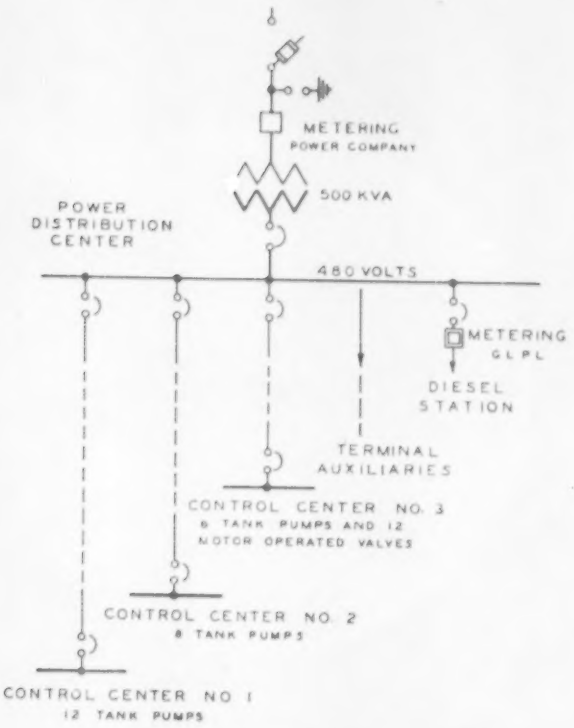


Fig. 4—One-line diagram for Sioux City terminal.

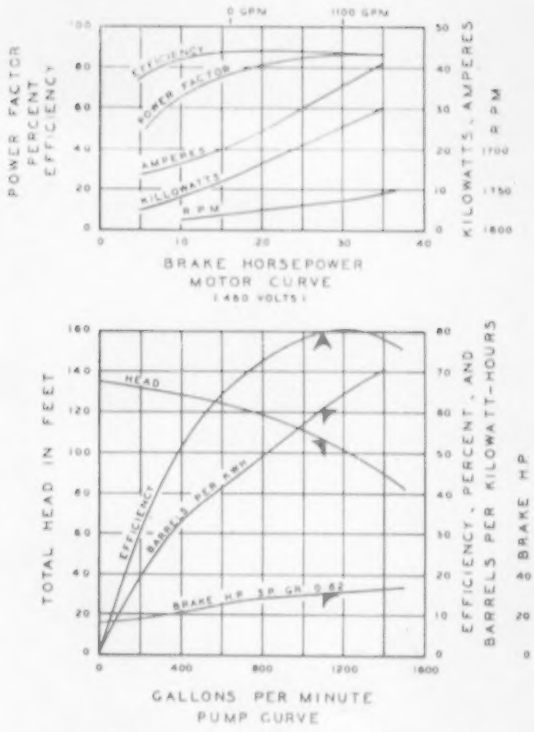


Fig. 5—Tank-pump and motor curve for 30-hp. pumping unit.

are diesel driven. Fig. 3 shows curves of the 1955 cost per kw.-hr. for the three classifications. As shown by the curves, the terminal costs per kw.-hr. are less for the electric station-terminal combinations.

Many of the electric rates have power-factor clauses which affect the energy costs. Over 92 per cent of the connected load at the terminals is induction motors. Power-factor variation is from 73 per cent with a closed-pump discharge to 91 per cent at rated motor load. Power-factor correction is a point for consideration in reduction of cost.

Of the 15 rates, 9 have power-factor penalty clauses. Each case requires an individual study for the reduction of the electric cost by the application of capacitors.

Electric Load

Fig. 4 shows a one-line diagram which is representative for 10 terminals. At the five other locations, two or more distribution transformers are

Fig. 6B—Tank-pump control schematic (suction valve remotely controlled).

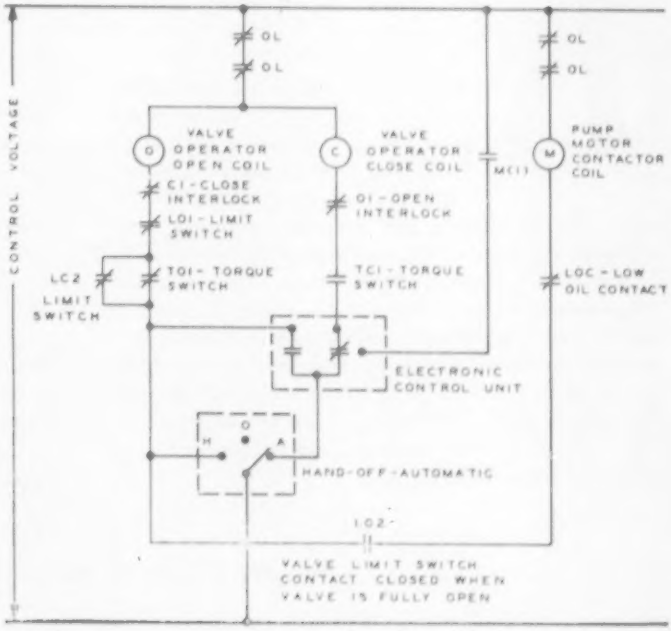
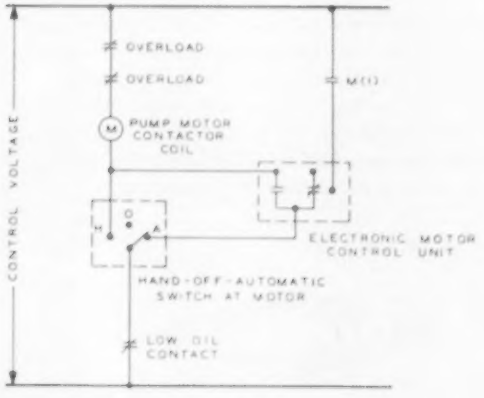
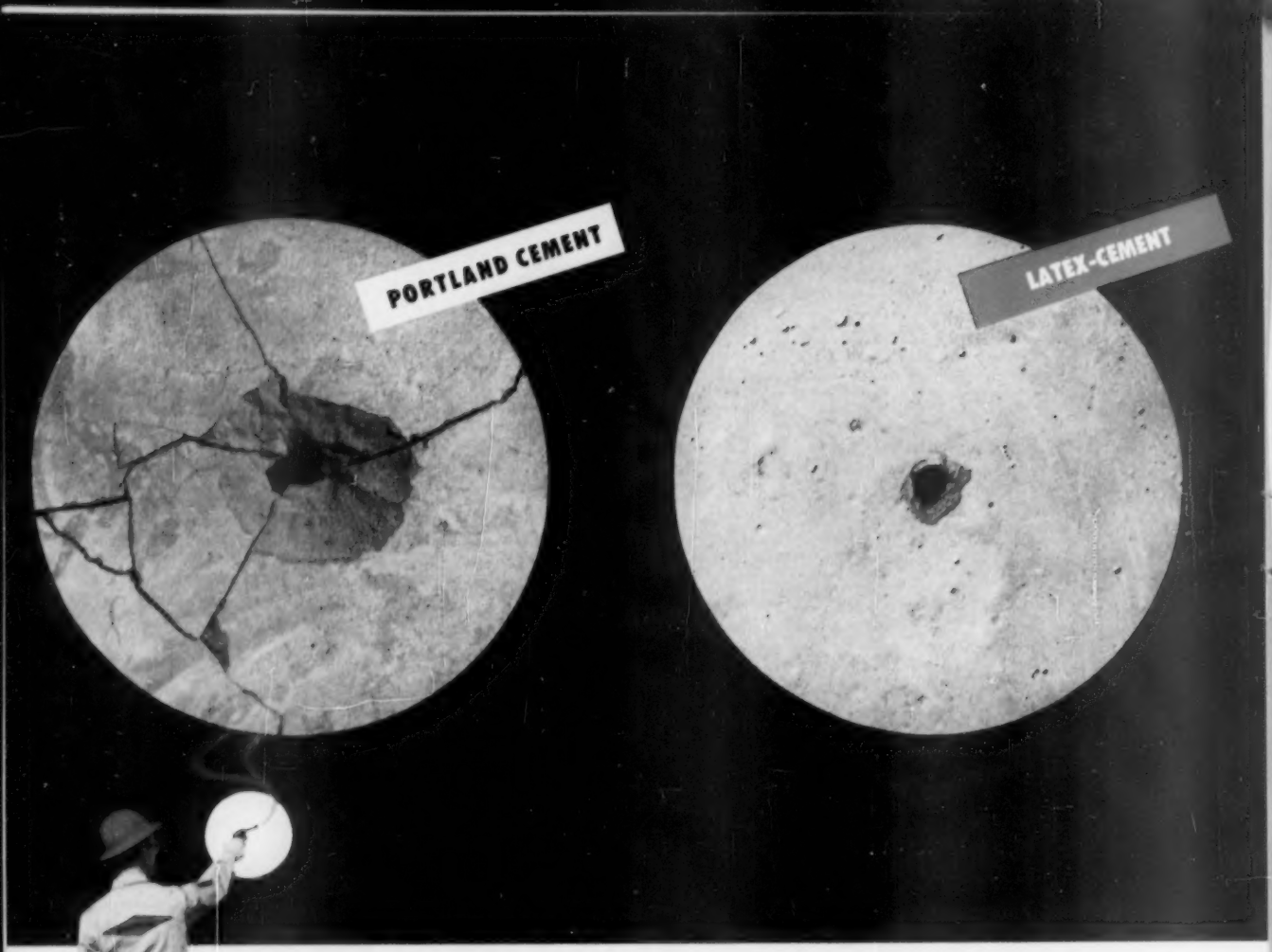


Fig. 6A—Tank-pump control schematic (suction valve manually operated).





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Laboratory tests and field experience indicate that the same thing may happen in your well. Cealment is especially useful for cementing a thin oil zone with gas or water nearby.

Resiliency is only one of many advantages of latex-cement. It bonds better, sets more dependably, and has shown excellent resistance to contamination by well fluids. More and more operators are finding that they are money ahead when they use Cealment.

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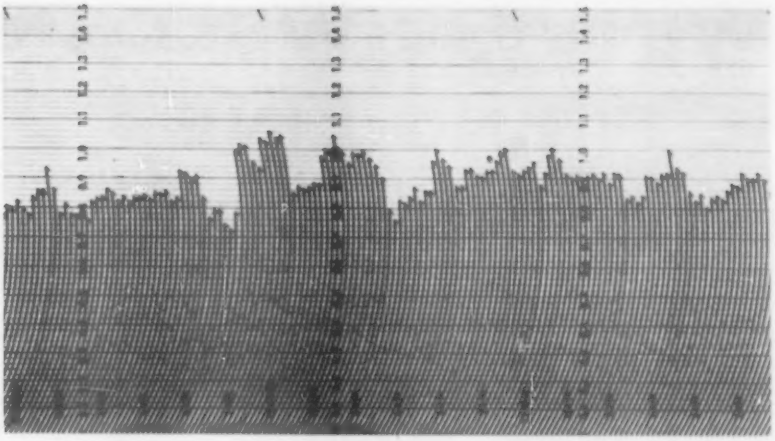


Fig. 7—Power company's demand chart representative of week's operation.

used. Terminal power is distributed at 480 volts and tank-pump motors have a nameplate rating of 440 volts.

Following is a tabulation of the average connected load for a terminal.

AVERAGE CONNECTED LOAD — 15 PRODUCTS PIPELINE TERMINALS

Equipment—	Per cent
Tank pumping units, 30 to 100 hp.	79
Valves—motor operated*	4
Other motors	9
Transformers (high voltage — 480 volts, low voltage—120/240 volts)	5
Miscellaneous (near unity power factor)	3
Total	100

*Approximately 55 per cent of the tanks are equipped with motor-operated valves.

The above table shows that tank pumps are 79 per cent of the connected load. The pumping units are located at the individual tanks and the motors range in size from 30 through 100 hp. Approximately 99.5 per cent of the motors installed are 85 hp. or under Squirrel-cage induction motors are used for driving the pumps and the motors 85 hp. and under are cooled by the product being pumped.[2] The 100-hp. pumping units have totally enclosed, fan-cooled, and explosionproof motors.

Fig. 5 shows a manufacturers' test curve for a 30-hp. pumping unit. The 30-hp. classification was chosen to illustrate since 61 per cent of the installed units are of this size. The test curve shown represents one type of the 30-hp. pumping units.

The pump and motor curve are combined through brake horsepower using a fluid specific gravity of 0.82. The motor load, with the pump operating against a closed discharge valve, is 53 per cent of a full load value and the power factor at this condition is 77 per cent. At full load motor rating the power factor increases to 86 per cent.

Varied terminal operations produce motor values between 77 and 86 per cent. An additional curve, barrels per kw.-hr., is added to the pump-test curve. It is developed from the pump output in barrels at the specific gravity of 0.82 and the motor input in kw.-hr. Barrels per kw.-hr. will be referred to later under the electric trend.

Controls . . . There are 10 different control schematics used for controlling the tank-pump units at the 15 terminals. Two of the ten are shown in Figs. 6A and 6B. The remote operation is accomplished by one of the following methods: (1) five-wire 110-volt control, (2) 24-volt d.c. control, (3) electronic control.[3]

Fig. 6A illustrates a control schematic used for remote pump-unit operation with the suction valve manually operated. This schematic is typical for control of 34 per cent of the tank pump units.

Fig. 6B illustrates a control schematic for remote pump operation through re-

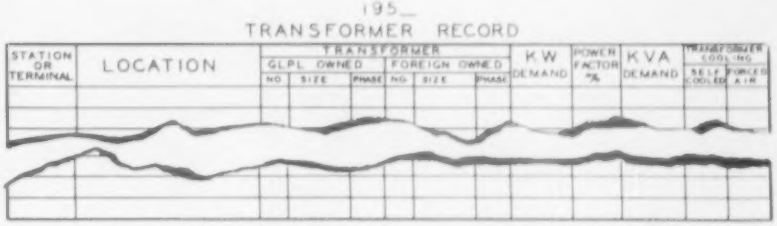


Fig. 9—Transformer record page summarizes maximum loads.

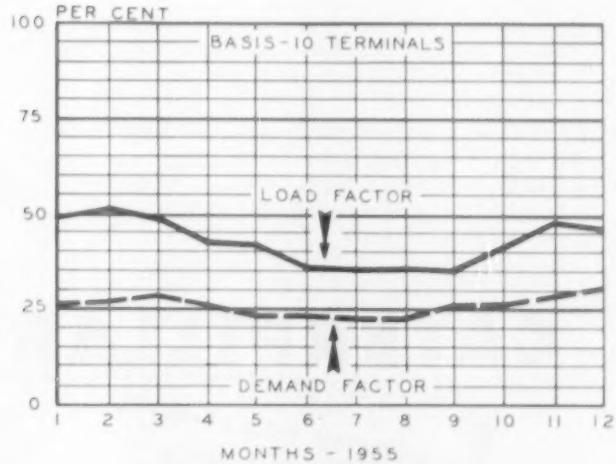
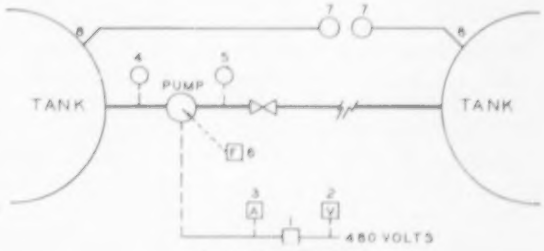


Fig. 8—Load factors and demand factors.



TEST EQUIPMENT

1. Circuit analyzer with ammeter, voltmeter, wattmeter, and power factor meter, instrument transformers if above self-contained values.
2. Recording voltmeter.
3. Ammeter, indicating, clamp-on type.
4. Suction pressure gage.
5. Discharge pressure gage.
6. Tachometer, resonant Reed type.
7. Remote reading tank gage.
8. Hand line measurements of tank.

Fig. 10—Tank-pump test procedure.

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MODERN HEAVY-DUTY PIPELINE WELDERS

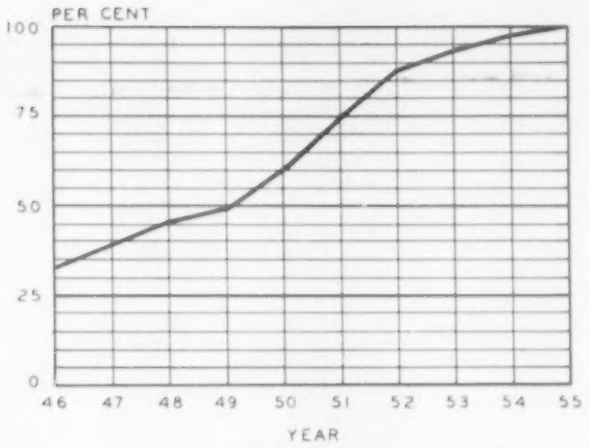

Fig. 11—Ten-year product-delivery trend.

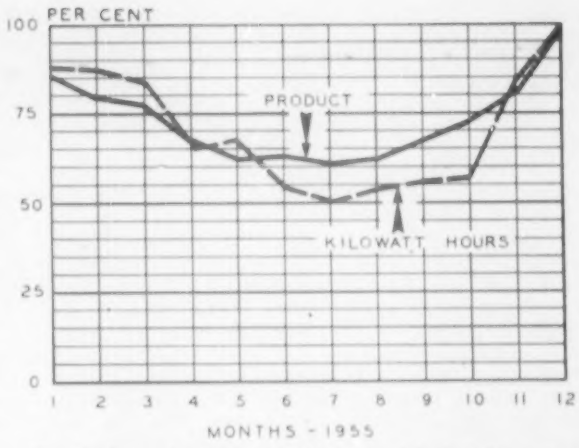

Fig. 12—Seasonal variation of deliveries and load during year.

mote control of the suction valve. Starting and stopping of the pump unit are controlled by the suction-valve limit switch. When the suction valve is fully open, valve limit switch "LO2" closes in the pump-motor circuit, starting the unit.

When the suction valve starts to close, LO2 opens in the pump-motor circuit, stopping the unit. This method of remote operation of the pump unit through the valve limit switch is typical for 55 per cent of the tank-pump units.

The accompanying tabulation shows the remote-control tank-pump operation at 15 terminals.

REMOTE-CONTROL TANK-PUMP OPERATION AT 15 TERMINALS

Terminal number	Remote tank-pump operation: Per cent manual valves	Per cent motor-operated valves
1	0	100
2	0	100
3	0	100
4	100	0
5	41	59
6	59	41
7	0	100
8	54	46
9	77	23
10	77	23
11	100	0
12	74	26
13	77	23
14	100	0
15	0	100

Electric use . . . A section of a power company's demand chart is reproduced in Fig. 7. As shown, the load is used throughout this 36-hour period. The chart is representative of operation from 12:01 a.m. Monday to 4 p.m. Saturday.

The load factors and demand factors in Fig. 8 are an average of 10 terminals for 1955. The load factor (kw.-hr. × 100/kw. demand × 730) variation is from 35 per cent to 51.4 per cent. It is within a desirable classification. The demand factor (kw. demand × 100/total connected kw.) variation is from 22 per cent to 30.8 per cent. The design of the terminal for flexible delivery operations with pumping units installed at individual tanks result in this low demand factor.

Since the transformer capacity is selected for this low demand factor, it is necessary to know the transformer loading. About 95 per cent of the installed transformer capacity is owned by Great Lakes Pipe Line Co. and the sizes range from 225 to 500 kva.

By supplementing the power companies' metering with additional metering where the load is supplied through more than one transformer, the loading of the transformer may be obtained. Additional metering is also used to separate the station and the terminal electric use.

The demand readings are recorded monthly and condensed on a yearly transformer record shown in Fig. 9. This gives a summary of the maximum transformer loads occurring during the year.

An additional benefit of capacitors may be realized through the reduction of reactive kva. capacity. For example

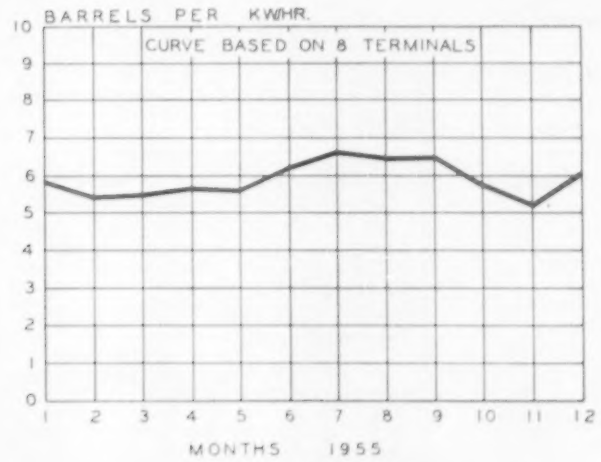

Fig. 13A—Barrels delivered by kilowatt-hour by months.

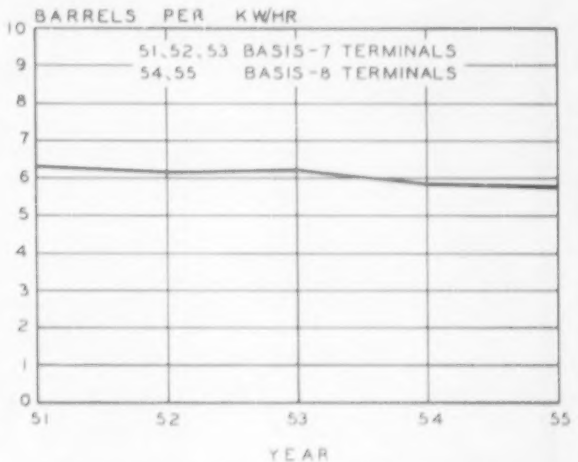

Fig. 13B—Barrels delivered per kw.-hr. from year to year.

a 345-kva. load at 75 per cent power factor would be reduced to 278 kva. if the power factor was improved to 93 per cent. In this example two additional 30-hp. pumping units could be added without an increase in transformer kva.

Equipment testing . . . Field checks are made on equipment to determine the performance under actual operating conditions. These field checks may be either routine or special investigations of reported abnormal conditions. Fig. 10 shows a tank-pump procedure used by Great Lakes Pipe Line.

As shown, a portable indicating circuit analyzer is used to measure the electrical values. It is used at the control center which is located in a non-hazardous area. The product flow rate is determined by measuring the time required to transfer a known volume of product from the tank.

Tests indicate how the equipment is operating in relationship to expected performance. Deviations from expected performance would indicate if corrections in equipment are necessary.

Some of the benefits of establishing performance of units are:

. . . Increasing pump efficiency by maintaining product recirculated for motor cooling at the correct flow.

. . . Elimination of pump overloads.

. . . Sizing units to meet the most satisfactory performance.

Delivery trend . . . Fig. 11 shows the trend in product deliveries for the 10-year period, 1946-1955. It illustrates an increase each year.

To show the changes during the year Fig. 12 is included to show the monthly variation in 1955 for product deliveries and kw.-hr. This curve shows a minimum during the months of July and August with the maximum occurring in January and December. As expected the kw.-hr. follows a trend similar to the product-delivery trend.

Capacities . . . Referring back to Fig. 5 the curve barrels of product delivered per kw.-hr. is added to the tank-pump curve. This value (barrels per kw.-hr.) is 61 at rated g.p.m. and 0.82 sp. gr. The total barrels of product delivered by the terminal per total kw.-hr. used is applied for the terminals.

Fig. 13A shows the barrels delivered per kw.-hr. in 1955, which is the average of eight terminals. The variation is from 5.2 to 6.7 bbl. per kw.-hr. To determine the change over a longer period of time the same information is plotted in Fig. 13B on a yearly basis for the past 5 years. As is noted from the curve, the barrels delivered per kw.-hr. is near six.

At this time sufficient information is not available to account for all of the difference between the 61 bbl. per kw.-hr. as shown on the pump curve, and the actual total terminal deliveries of 6 bbl. per kw.-hr. It is realized that the over-all barrels per kw.-hr. for the terminal include the energy used by the terminal auxiliaries (21 per cent of the connected load) and energy used by pump motors for tank circulation and transferring product within the terminal.

This information has been of help in calculating and verifying the terminal energy use at station-terminal combinations where additional electric metering had not been completed.

With the correlation between barrels delivered and electric energy use, a basis is established for predicting the electric use for the estimated deliveries. A method is outlined as follows:

1. Energy use by terminal:

$$\text{Kw.-hr.} = \frac{\text{Barrels delivered (estimated)}}{\text{Barrels/kw.-hr.}}$$

The barrels per kw.-hr. used in the above equation is an empirical figure and, as shown, is much lower than the figure obtained from a typical pump curve. This value is based on the actual operating figure of the terminal. For Great Lakes Pipe Line, as previously shown in Figs. 13A and 13B, this figure is near six, which is the average of eight terminals.

2. Estimated kw. demand:

$$\text{Kw.} = \frac{\text{Kw.-hr.} \times 100}{\text{Load factor (per cent)} \times 730}$$

The kw.-hr. estimate is used in the load-factor equation to estimate the kw. The load factor should be based on previous load-factor conditions at the terminal under consideration. For Great Lakes Pipe Line the load factor varied from 35 per cent to 51.4 per cent in 1955 as previously shown in Fig. 8. The corresponding estimated load factor for the period of the estimate should be used.

Acknowledgments

The author wishes to acknowledge the counsel and assistance from Curtis H. Scruggs and Paul R. Madden in the preparation of this paper.

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2. Paul R. Madden, Electric Power for Products Pipeline Pumping, P.E.P.A., twenty-fifth annual convention, Oct. 5-7, 1953, pp. 1 to 3.
3. Curtis H. Scruggs, Electronic Controls for Products Pipeline Terminals, A.P.I. Products Pipeline Technology Conference, Apr. 20-23, 1953, pp. 1 to 8.

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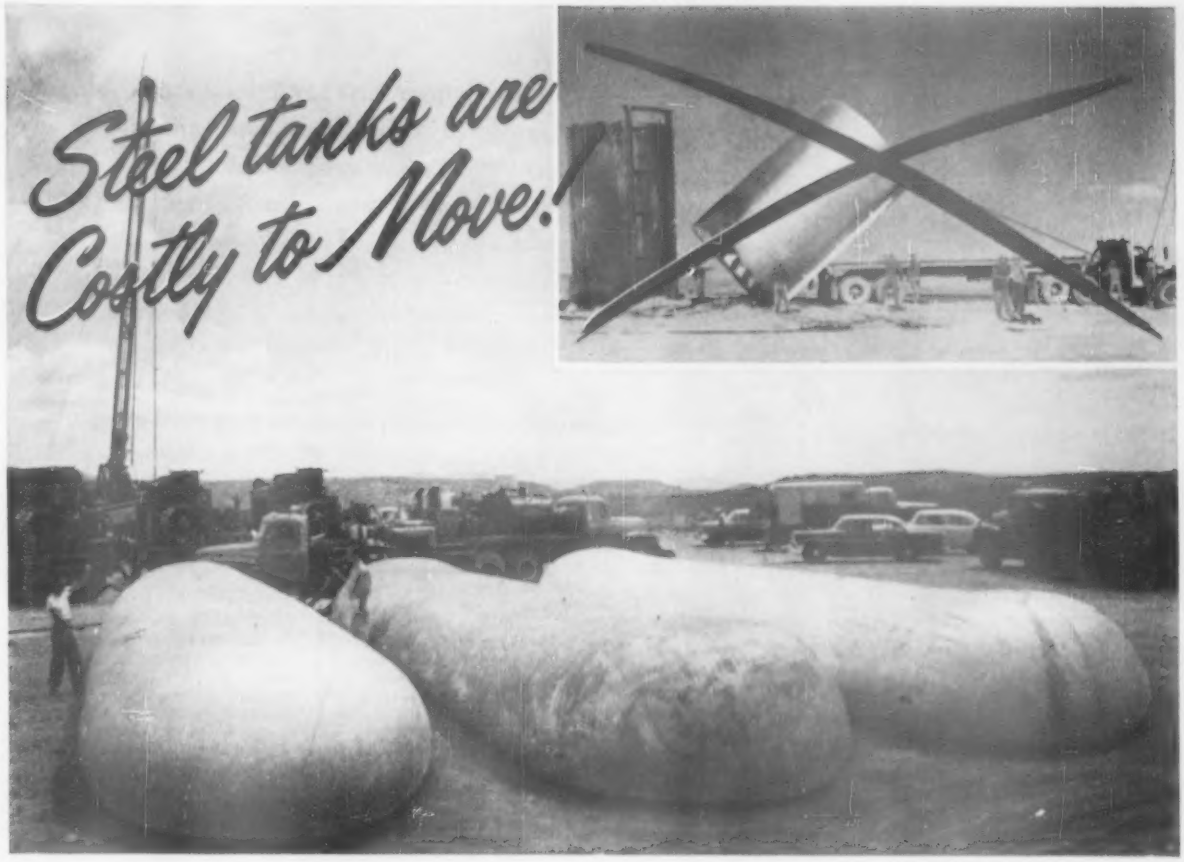

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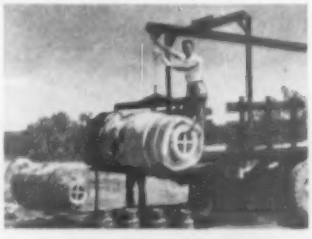

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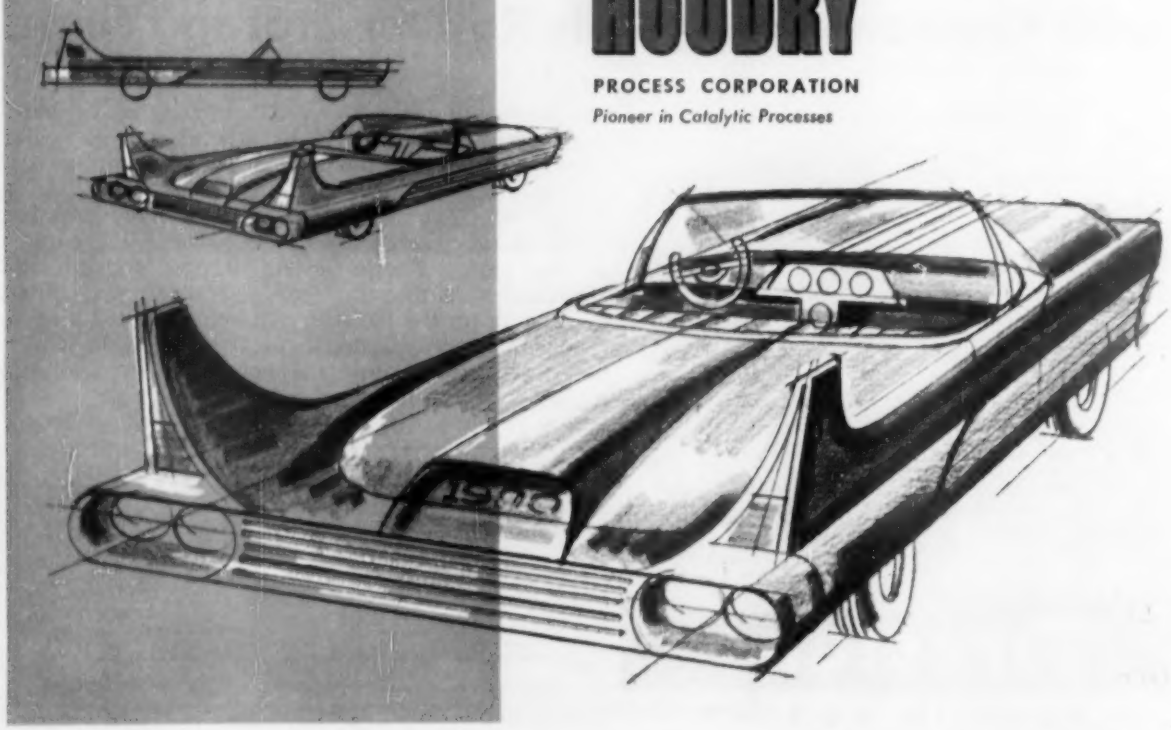

PAINTING STEEL

Part 12

Should Piping Be Painted or Covered?

by J. O. Jackson* and Joseph Bigos†

PIPING is costly to paint. In some cases it is cheaper to replace small piping than to preserve it by painting. Tapes, covers, boxes, conduits, and similar protective coverings that eliminate the need for painting should be investigated. Plastic and corrosion-resistant alloys are often economical for the small-size tubing and pipe. The larger sizes of pipe lend themselves to economical painting.

Exposed piping should be painted with the same protecting systems as already outline for the reminder of the refinery; e.g., cold pipes or hot pipes would be painted with the same system as for the process unit.

Color coding . . . Piping should be color coded in compliance with the standards of the National Safety Council and the American Standards Association. The entire pipe does not need to be color coded; but bands should be applied near all valves, tees, branches, outlets, and wherever a potential hazard exists because of possible misconnection.

Stencilled names have been in vogue in the past; but it is now cheaper, quicker, and more attractive to use decalcomanias for markings. A summary of color identification is given in Table 12.

Underground piping requires maximum protection. Hot coal-tar enamel, hot-asphalt mastic, and cement are believed the best materials for this service. Coal-tar enamel is covered as an alternate in Paint System No. 9, but the enamel specified is plasticized water-works grade.

A conventional pipeline enamel may be more satisfactory for refinery use. Asphalt mastic—just as all asphalt coatings—is dissolved or softened by spilled crude oil or hydrocarbon stocks. Care must be exercised in where it is used.

Painting of buildings . . . The exteriors of buildings are exposed to the weather, and the steelwork requires the same protection as for the remainder of the refinery. Except for buildings housing chemical-process units, which require the protection specified for chemical-process units, the interiors of most buildings are rather noncorrosive.

Offices, garages, warehouses, control rooms, locker rooms, cafeterias, etc., belong in the noncorrosive area. They have need for attractive harmonious surfaces of good appearances, with light reflectivity being especially important.

Space prohibits extensive discussion of color conditioning; but expert advice should be solicited inasmuch as it costs no more to color condition when repainting than to repaint in the typical dark, drab, dismal manner.

Table 12—Piping Identification Colors*

Assign each material carried to one of the following classes:

F . . . Fire protection . . . Red.

D . . . Dangerous materials . . . Yellow (or orange).

S . . . Safe materials . . . Green (or white, black, gray, or aluminum).

P . . . Protective materials . . . Bright blue.

V . . . Extra valuable materials . . . Deep purple.

Assign a striped pattern or legend to each material in each class.

Use any good colored enamel or paint that will be compatible with the environment. In chemical environments the pigments must be selected so that color changes or fading does not occur.

TT-E-389b—Includes all colors in gloss.

TT-E-529—Includes all colors in semigloss enamel.

See colored semigloss or gloss striping paints in Paint System No. 6.

*Steel Structures Painting Manual.

Table 13—Paint System No. 9, Bituminous Coatings

(Enamel, cold-applied mastics, and emulsions)

Paint System No. 9 requires commercial blast cleaning or pickling in the standard system. One thick coat of cold-applied asphalt mastic (S.S.P.C. Paint 12-55T) is the standard bituminous coating. This may be applied in two coats when specified. This standard mastic is suitable for chemical, atmospheric exposure, but not underground.

Similar systems are included as alternates using coal-tar mastics, asphalt emulsion, and coal-tar emulsions. These latter materials generally are applied in at least two coats with coal-tar mastic giving best results.

Coal-tar emulsion is used to protect coal-tar cutbacks or enamels from sunlight. Coal-tar primers and enamel are included as alternates in this system. A.W.W.A. C203-51 is used for fresh-water immersion, including potable, and underground use, while Bureau of Yards and Docks 34 Yb coal-tar primer and enamel is used for marine structures.

*Pittsburgh-Des Moines Steel Co., Pittsburgh. †Senior Fellow, Mellon Institute of Industrial Research. Paper presented at A.P.I. Refinery Division meeting Montreal, 1955.

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by W. L. Nelson
Technical Editor

Cost of Refining High-Sulfur Crudes

We have been criticised for the high price that we must charge for gasoline, which we must produce from "sour" crude oil. What has been the general experience of refiners on the cost of processing sour crude oils? S.M.T.

Scarcely any records of actual refinery experiences are available because of the many interlocking factors which make it difficult to isolate the cost of high sulfur or sourness as a separate item. However, Walter Miller,[1] of the old Marland Oil Co., stated in 1926 that the extra cost of handling Panhandle crude oil as compared with the conventional Mid-Continent oils of that period, was 25 cents per barrel.

Information is also given on pages 581-582 of McLean and Haigh[2] by which an estimate may be made. With respect to the amount of labor required for 25,000-bbl. per day plants operating on sour (and high sulfur) and sweet crude oils, they find:

	Men per 1,000 bbl.	
Crude oil	Large refiners	Small refiners
Sour	20.15	12.2
Light sweet	14.95	8.5
Extra men	5.2	3.7

At a wage rate of $78 per week (1950), this amounts to 5 cents per barrel (range of 4.1-5.8). They also indicate a larger investment of $480 per barrel for the sour-oil plant, which at an interest rate of 6 per cent amounts to 8 cents per barrel. In addition, there will be extra treating costs and the cost of extra tetraethyl lead, making a total in the range of:

	cents per bbl.
For manpower	5.0
For investment	8.0
For TEL, etc.	8-13
	21-26

They were considering West Texas and East Texas (or Gulf Coast) crude oils and they state an extra operating cost with the sour oil of 25.3 cents per barrel.

These conclusions check reasonably well with similar studies made by the author of this page[3-7] (see Table 1).

TABLE 1—EFFECT OF SULFUR ON THE COSTS OF OPERATION[3-7] (1953)
(Cents per barrel)

	West Texas	East Texas or Gulf Coast	Extra Cost
Sourness	3.5-5.5	-	3.5-5.5
Sulfur (1.0-1.8 per cent)	5.5-13.0	-	5.5-13.0
Tetraethyl lead	12-16	5-9	7.0-9.0
Total cost due to "sour" crude oil			16-27

Finally, posted schedules (see Table 2) seem to substantiate the above conclusions although it must be admitted that posted prices do not always faithfully represent the quality differences of oils or the true values of the oils.

In summary, the several sources indicate:

	Cents per bbl.
Miller (1926)	23-28
McLean and Haigh (1950)	21-26
Nelson (1953)	16-27
Posted prices (1950-1954)	21

TABLE 2—COMPARISON OF THE POSTED PRICES OF SOUR AND SWEET OILS

	A.P.I.	Sweet	Sour	Difference, cents per bbl.
Arkansas (1954)	30.5	$2.70	$2.60	10
Wyoming and Montana (1954)	30.5	2.70	2.39	†31
Wyoming and Montana (1954)	20.5	2.50	1.83	†67
Wyoming and Montana (1954)	39.5	2.88	2.70	†18
West Texas and New Mexico (1954)	30.5	2.70	2.57	*†13
Louisiana-Arkansas (1950)	30.5	2.43-2.55	2.36-2.41	7-14
Wisner Michigan (1950		2.72	2.45	27
Dorcheat-Macedonia Condensate (1950)		2.85	2.80	5
Cotton Valley Condensate (1950)		2.85	2.70	15
Average				21

*Possibly too small because so-called sweet West Texas oils are actually "sour."
†Inadequacy of the 2-cent differential per degree A.P.I. may account for part of the difference, but it can increase as well as decrease the difference.

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Wettability of Weighting Agent for Drilling Mud

Are there simple methods of ascertaining whether a powdered solid is preferentially water-wet or on the contrary, oleophillic? This is in connection with the application of weighting materials in oil-base and emulsion drilling fluids. Sometimes we find that weighting materials settle down with the water out of oil-base muds or otherwise destroy drilling emulsions by separating together with the oil. L.F.U.

After talking with several drilling men, it appears that the wettability can be judged in most instances by simply shaking up a small amount of the finely divided material (over 200 mesh) with equal amounts of isooctane (or gasoline) and water (2 or 3 ml. each) in a test tube. The material then associates itself mainly with the water or with the oil. The test is usually satisfactory.

However, the question indicates that the viscosity or gel strength of the mud is too low for such a material or that the material needs to be reduced to nearer colloidal sizes of particles. Perhaps the addition of lampblack or blown asphalt would stiffen the mud.

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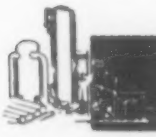
5618 (OG)

by J. W. Cronenberg



How Glycol-Amine Plants Operate—1

THE glycol-amine process was first developed and used where simultaneous purification and dehydration of natural gas was desired. By use of this process, natural gas may be treated readily so that the effluent gas will contain less than 0.25 grains of hydrogen sulfide per hundred standard cubic feet, and less than 0.01 mole per cent carbon dioxide. In addition, gas containing not more than 9 lb. of water vapor per million standard cubic feet can be produced.

Glycol-Amine Process

Details of the glycol-amine process have been adequately described in available literature.[1,2,3] Sour gas, at normal temperature enters the bottom of a bubble-cap column in which it is contacted counter-currently with the diethyleneglycol-monoethanolamine solution, and leaves the top of the vessel as sweet, dehydrated gas.

The rich solution flows from the bottom of the conductor through a liquid-level controlled valve and after passing through heat exchangers, enters the regenerating column or still. Here, at low pressure, acid vapors are stripped from the solution by further heating and by contact with the rising vapors in the column.

The acid gas and water vapors leaving the top of the still are passed through a condenser and reflux accumulator from which reflux for the still is obtained. The reflux serves a two-fold purpose: to knock back amine in the rectifying section of the still, and to provide stripping vapor.

The solution leaving the bottom tray of the still is heated in a steam-driven reboiler to provide stripping vapor. The lean solution flows from the reboiler, back to the still bottom and from a still through heat exchangers where part of its heat is given up to the rich solution flowing to the still. The lean solution is then pumped through solution coolers and back to the top of the contactor, completing the cycle.

Author is with El Paso Natural Gas Co., El Paso, Tex. Paper presented at N.G.A.A. regional meeting, Odessa, Tex.

El Paso Units

El Paso Natural Gas Co. is currently operating 21 such glycol-amine units having a total gas-treating capacity of 1,503 M.M.s.c.f.d. They range in capacity from 11.5 to 165 M.M.s.c.f.d. and handle sour gas containing from 16 to 647 grains hydrogen sulfide per hundred standard cubic feet and from 0.103 to 5.367 mole per cent carbon dioxide. Solution circulation rate ranges from a minimum of 28.5 to a maximum of 630 g.p.m.

A 3 to 1 mole ratio of monoethanolamine to total acid gas is the basis for solution circulation design and 1.6 to 1.0 mole ratio of reflux to total acid gas the basis for reflux flow design. In actual plant operation, since sweet gas is of paramount importance, these design ratios are almost always equaled or exceeded.

Problems

The three most important problems connected with the operation of these glycol-amine plants according to the author's opinion are: (1) corrosion of plant equipment, (2) fouling of plant equipment, and (3) solution losses.

All of these problems are intimately related and complex. Corrosion in these plants has been well described in the available literature.[4,5,6,7]

What factors? . . . It is generally believed that the following factors contribute to plant corrosion:

1. High percentages of amine. This has been shown by laboratory tests and field observations. Plants whose solutions contain 20 to 30 per cent amine have almost always had more corrosion troubles than plants with lower amine concentrations. As an example, carbon-steel reboiler life in Plant 4 with an amine percentage of 22.7 has averaged 353 days for three bundles while a similar bundle in Plant 9 whose solution contains only 9.0 per cent monoethanolamine has been in service for over 2,700 days without failure.

Design practice in our company has been to establish solution-circulation rates on the basis of 15 to 20 per cent amine. In actual operation, we have tried to hold amine concentrations as low as possible and still produce gas sweet to the Bureau of Standards Lead Acetate test.

2. High temperatures. Laboratory tests and field observations show the tremendously detrimental effect of high temperatures. These can be lowered only by sacrificing dehydration in the glycol-amine process.

3. High velocities. Field observations show that high velocities through plant increase the rate of corrosion. This can be alleviated by improving equipment design and by installing a hydrocarbon gas separator between the contactor and cold exchanger to remove intrained hydrocarbon gases. An acid-gas separator installed in the rich solution line between the hot exchanger and the still for the removal of evolved hydrogen sulfide will further reduce the velocity in the still feed piping.

4. Degradation products. Laboratory investigation indicates that solution degradation products influence corrosion. By vacuum distillation of a sidestream of plant solution, some degradation products can be removed from the system as they are formed.

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Penrod Drilling Co., Shreveport, has a new wildcat operation under way for Southwest Gas Producing Co., Inc., in northern Calcasieu Parish, southwestern Louisiana. It is the operator's 1-A Walker in 8-8s-12w. Location is 2 miles southwest of Lucas, and about 3 miles southeast of North Starks field.

Circle Drilling Co., Lake Charles, has contracted for an 11,000-ft. test to be drilled for David C. Bintliff at a wildcat location a mile east of Welsh, in Jefferson Davis Parish, southern Louisiana. Location, at 1 Maebers, in 31-9s-4w, is about 2½ miles southeast of Welsh field.

Richardson & Stewart Drilling Co., San Antonio, is drilling a 9,000-ft. test at a wildcat location 9 miles northeast of Seven Sisters, in southeastern McMullen County, Southwest Texas. It is a contract job for Argo Oil Co., also of San Antonio. Location is listed as 1 Roos, in the Charles T. Stansel Survey.

Ocean Drilling & Exploration Co. is under contract for another well Shell Oil Co. will drill in East Cameron Block 17 field, about 4 miles off the coast of Cameron Parish, Louisiana, in the Gulf of Mexico. It is a 13,500-ft. job, on Shell's state lease No. 2546. It will be Shell's third test in the area. The discovery well was completed in March 1955 as a gas producer in Miocene sand at 11,956 ft. The second test was dry at 13,509 ft.

West Central Drilling Co. has a rig working on a remote wildcat location 3 miles northeast of Flomot, in northwest Motley County, Texas. It is an 8,500-ft. test for the company's own account, with General Crude Oil Co. holding an interest. Location is 3 miles northeast of Flomot. The county is in the upper western part of the state on the southern rim of the Pala Duro basin. The test is carried as 1 Ross with spot in Section 57, Block 4, T&P Survey.

Murphy Drilling Co. is contractor on the first of a series of 10 tests Steepie Oil & Gas Co. is planning to drill in East Panhandle gas field of eastern Gray and western Wheeler counties, in the Texas Panhandle. All wells are projected to the granite wash. Current operation is at 2-2 Fowler, in Section 2, Block 25, H&GN Survey.

Butler-Johnson, Inc., Bossier City, La., has a new deep operation in the northeastern sector of Sligo field, in Bossier Parish, northwestern Louisiana. It is a contract job for D. B. McConnell, of Shreveport. Objective is the Cotton Valley formation, expected

TOUR CHANGE on a rig Hall & Stewart Drilling Co., of Midland, Tex., is operating on contract in the Hobbs district, Lea County, southeastern New Mexico. Standing, left to right: C. F. LeBeau, tool pusher; C. F. Johnson, daylight driller; Troy L. Durham, derrickman; O. L. Gaston, engineman; and D. J. Rackley, and J. E. Swinton, floorman. Kneeling, same order: R. B. Ivey, evening-tour driller; T. J. Blair, derrickman; M. F. Williams, engineman; and M. E. Franklin, and E. W. Hudgens, floormen.

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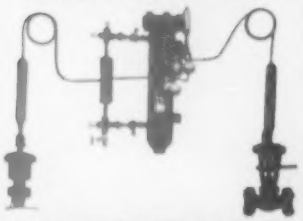

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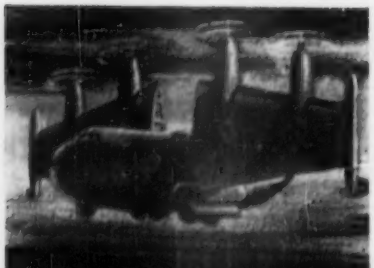

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about 8,500 ft. Location, at 3 Continental Securities, in 32-18n-11w, is just east of Barksdale Reservation.

Peterson Drilling Co., Shreveport, has a rig under contract to Marlin Exploration, Inc., and Sunray Mid-Continent Oil Co. for a 6,900-ft. Wilcox test at a wildcat location 2 miles southwest of Willetts, in Concordia Parish, eastern Louisiana. It is the operators' second test on their Kervin-Johnson lease in 19-6n-9e. First test was abandoned last October as a dry hole at 6,834 ft.

Leecraft Drilling Co. is contractor on a 4,000-ft. test Paul J. Moore and associates are starting in southwestern LaSalle County, Southwest Texas. Location is listed as 1 Martin, spotted in the J. M. Martin Survey. It is about 7 miles south of Artesia Wells.

Pearl Drilling Co., Alice, Tex., is drilling for Westpan Hydrocarbon Co. at a new operation in the La Jara area, 15 miles northwest of San Diego, northeastern Duval County, Southwest Texas. Contract is for a 5,000-ft. test at 1 Black, in the GH&H Survey. Location is northwest of San Patricio Oil Corp.'s and Pratt-Hewitt Oil Corp.'s recently completed Pettus gas-discovery well with pay at 4,500 ft.

Clyde Hall Drilling Co., Bakersfield, Calif., is putting down another deep test for Reserve Oil & Gas Co. north of Tejon field, near Bakersfield, in Kern County, California. Operators plan to take the hole to basalt at a depth of about 9,300 ft. The venture, 1½ miles from production, is designated as Reserve-J & J 85-21, with spot in 21-11-19.

Inland Drilling Co. has a new contract job in Washington County, northeastern Colorado. It is at a wildcat location, on a state lease, in 36-1s-56w, about a mile north of Kejr field, in the lower northwest corner of the county. Drilling is for Dow-McHugh and Arrow Exploration Co.

Longhorn Drilling Co., Three Rivers, Tex., is the contractor on the deep wildcat test Bowman Cattle, Frank B. Waters, and J. C. McCabe are starting in northwestern Dimmitt County, in far-southwestern Texas. Operators are shooting at the Lower Cretaceous-Glen Rose formation with 9,000 ft. as the permitted depth. The test, 1 Asher Richardson Estate, in H&GN Survey 5, is 5 miles southeast of Carrizo Springs and nearest production, which is from the Upper Cretaceous Navarro-Olmos sands.

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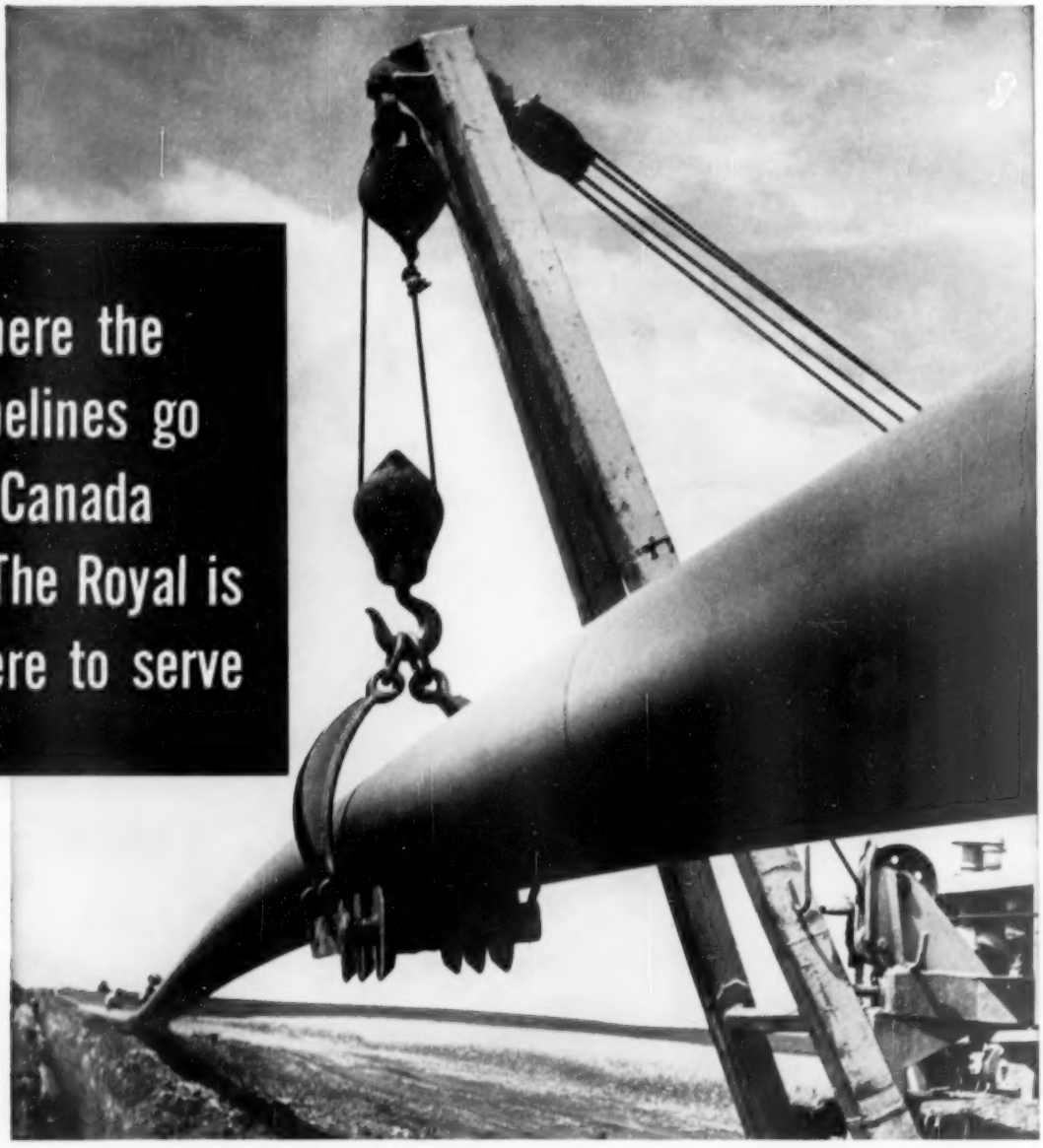

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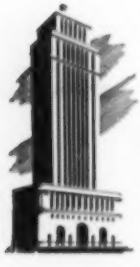

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Wound-rotor motors reduce power costs

by W. C. Clark

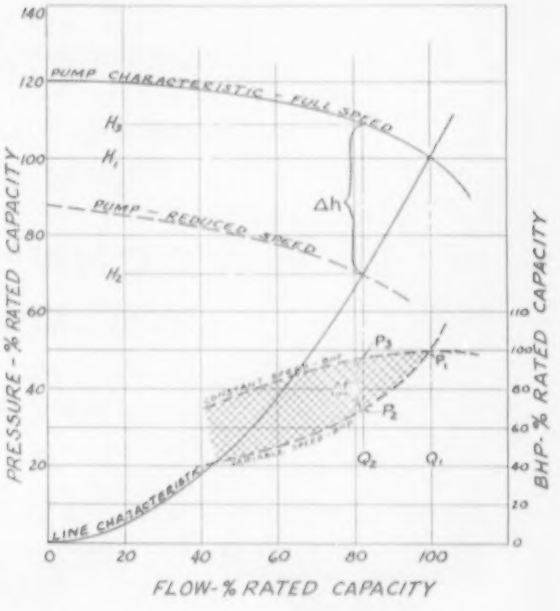

CHART shows comparison between full-speed and reduced-speed pump characteristics. Fig. 1.

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As an indication of the variable operation of our product line, as opposed to a relatively stable crude line, there have been as many as 20 products in the system at a given time. This creates an operating situation in which wound-rotor motors have much to offer. This can be seeen by a brief review of the fundamental advantage of this type of drive when considering one item—variations in flow.

Basic advantage . . . For purposes of illustration consider a pipeline with the pressure-flow characteristic shown in Fig. 1.

If we assume that this pipeline has one station, 100 per cent rated capacity, Q_1 will flow when the discharge from one pump, with a characteristic similar to that shown, is connected to the line and generates pressure H_1.

If it is desired to reduce the flow in the hypothetical pipeline to flow Q_2, lower line pressure H_2 is all that is required. But, if the pump is driven by a constant-speed prime mover it will, according to its characteristics, attempt to generate pressure H_3. Obviously, therefore, the new lower flow Q_2 can be achieved with the constant-speed pump only by throttling the difference between pressures H_3 and H_2 (Δh).

However, if the pump is driven by a variable-speed prime mover, the speed may be adjusted to create a new pump characteristic which will intersect the line characteristic exactly at the lowered pressure-capacity condition H_2, Q_2 and no throttling is required.

If we consider the horsepower requirements for the constant and variable-speed pumps at capacity Q_2, it can be shown that the constant-speed pump requires power P_3, which is greater than the power P_2 required by the variable-speed pump. The difference is "throttled-in-power," Δp, and represents energy wasted across the throttling valve.

In the case of our product line, which presently consists of 900 miles of varied sized pipe with 14 pumping stations, evaluation of various factors pointed to an attractive saving in power cost through the use of wound-rotor drives.

Special motors designed . . . The first installation of wound-rotor drives for centrifugal pumps was made in 1935 at a time when line capacity was being increased. Wound-rotor motors were initially installed in two stations, one unit per station. Each drive consisted of a 600-hp., 3,600-r.p.m., 2,200-volt, open motor.

Efficient pump operation called for 3,600 r.p.m., and preferably with a motor of the same speed. At the time no such wound-rotor motor was available, and problems associated with this speed called for special treatment in the motor design. Rotor construction consisted of one heavy conductor per coil side, with end turns protected against centrifugal forces by a nonmagnetic steel cylinder fitted tightly around them and tapered down to the shaft.

Two separately driven oil pumps were provided to force-lubricate the sleeve bearings. This feature, in combination with an oil cooler, eliminated excessive bearing temperature resulting from rotor heat. Considering the small size of the rotor, the amount of power developed within it, and its smooth external surface not conducive to good heat transfer, rotor temperature was recognized as a design problem. The final design has proved itself over the years and is another example of an engineering development to satisfy an industry need.

Control, additional units . . . The control consists of an oil-immersed breaker for the stator and a 13-point manually operated drum switch in the rotor circuit.

Speed control is designed to give a range of 2,400 to 3,600 r.p.m. Motor and controller are mounted close to each other in a room separated from the pump room by a solid fire wall with the pump drive through a stuffing box in the wall.

Since the original wound-rotor installations, additional drives of the same size have been added until there are now a total of 11 such units. In 1954,

Author is with Atlantic Refining Co., Philadelphia. Paper presented at A.I.E.E. Petroleum Industry Electrical Conference, Kansas City, Mo.

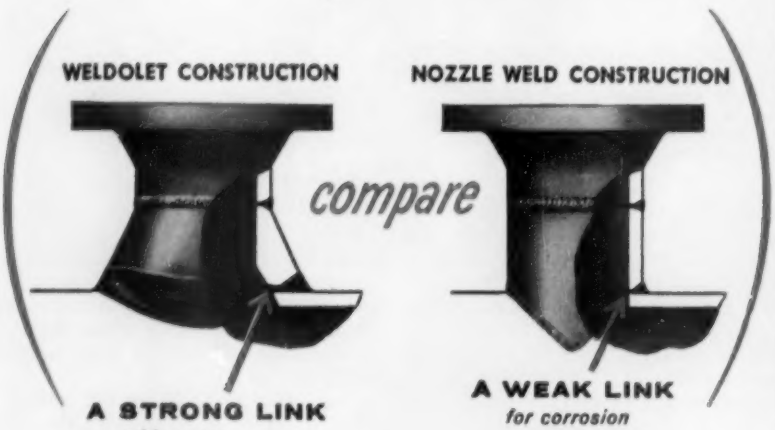
→ **years** to your piping

→ **gallons** to your flow

→ **strength** to an otherwise weak link

add → **BONNEY WELDOLETS**

to your piping drawings for all branch connections



A STRONG LINK
adds years
gallons
strength
and assures a clean, properly fabricated and properly designed branch connection

A WEAK LINK
for corrosion
external forces
internal pressure

Labor costs are now at an all time high. Reevaluation of your piping costs will now reveal Weldolets 4" and smaller to be less costly to fabricate than unreinforced nozzle connections. In the field this is also true of larger sizes and Weldolets are always more economical than branch connections made by welding tees or reinforced nozzles. Weldolets are manufactured in all sizes from 36" and all weights from xxs, in carbon steel, stainless, alloy, wrought iron and non-ferrous metals.

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PENNSYLVANIA DIVISION
BONNEY FORGE & TOOL WORKS
ALLENTOWN, PENNSYLVANIA DEPT. H

PIPELINE PATROL

as delivery time of 3,600-r.p.m. drives was unsatisfactory, four installations were made of 900-hp. motors with motor speed of 1,800 r.p.m. and a speed increaser to 3,600 r.p.m. The slower-speed motor plus gear was less expensive than a 3,600-r.p.m. motor, though this was partially offset by the added problem and efficiency of a gear unit and expense of increased space required by the low-speed drive.

All stations on this line are continuously attended, and pumping operations are entirely manual except for emergency shutdown devices. Speed is set to give the desired hydraulic condition and is often predicated on maximum allowable line pressure.

Maintenance . . . The 600-hp., 3,600-r.p.m. units were followed closely during their initial operation to guard against troubles arising before sufficient experience had been gained to set up a desirable maintenance program.

As might be expected with any newly designed equipment, a few problems did occur that should not reflect adversely on the over-all success of their operation. Some rotors had to be rebalanced before vibration came within satisfactory limits, some changes in type of collector ring were required, and a little time was required to find the best grade of carbon brush for this particular operation.

Aside from these initial problems, operation of the motors has been entirely satisfactory. Maintenance procedures are similar to those used for the general run of electrical equipment. Slip rings and brush holder assemblies are cleaned periodically, and rings are resurfaced approximately once a year. Three motors have had their rotor windings reinsulated after an average life of approximately 15 years each.

Both motor and control are given a yearly inspection and cleaning. Every other year the rotors are removed to allow cleaning, and painting if required, to the stator windings. As there is no exposure of the rotor windings, no such maintenance of them is required. Slip rings must be replaced approximately every 10 years.

To date the newer 900-hp., 1,800-r.p.m. motors have not been in operation long enough to conclude what long-time maintenance will be necessary. Their performance so far has been satisfactory with only routine inspection and cleaning required. As they are of proved conventional design, we have complete confidence in their continued trouble-free performance.

Power savings . . . Because of the great variation in the pipeline operations, no

exact comparison could be made between power costs as they exist and what they would have been with constant-speed drives.

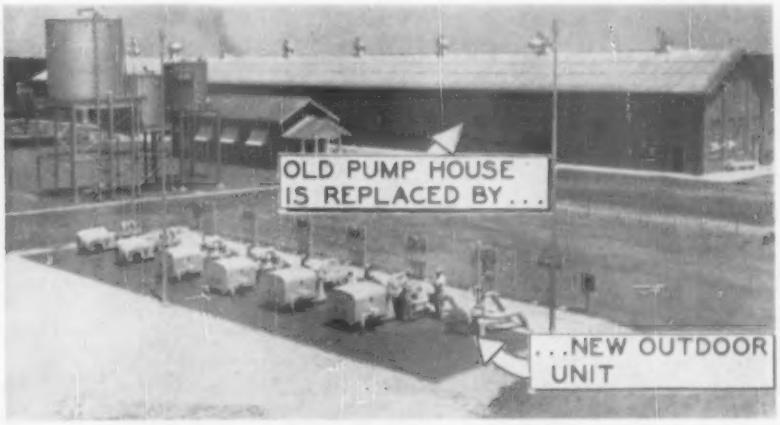
For an average condition, pumping a normal variety of products at rates that occur on the line, annual power savings per 600-hp. unit amount to approximately $7,100, based on an average cost of 1 cent per kilowatt-hour. This varies from station to station and from year to year. This $7,100 yearly figure results in an approximate 3-year payoff on the added cost of a wound-rotor over a squirrel-cage drive. This is based on today's cost difference of $20,000 for a 600-hp. unit, the figure being somewhat less at the time of installation of most of the existing wound-rotor drives.

Power factor at reduced speeds is a two-way variable dependent on both speed and load. The concern about power factor is its effect on kva. billing demand. This latter item is not adversely affected as low power factor occurs simultaneously with periods of low horsepower requirements.

At the present time a number of pumping units operate a large portion of the time at full speed while pumping gasoline, hence show considerably less power savings than in the past. However, they have already more than paid for themselves, and even at the full flow continue to show savings pumping fuel oils when throttling of a constant-speed motor would be required.

This condition was expected, and it could again in the future result in a single wound-rotor unit being installed, larger than needed for present flows, but capable of efficiently picking up the load as pipeline usage increases.

Successful operation of our product pipeline has so clearly demonstrated the soundness of wound-rotor drives that our most recent installations of them were made without hesitation. This type of drive has been as dependable as squirrel-cage motors. Their maintenance costs, while higher than for squirrel-cage motors, have been surprisingly modest and have not been significant in the over-all economics.



THIS PUMPING STATION has remote electronic-gage control.

Humble operates station with push-button control

ELECTRIFICATION of Humble Pipe Line Co.'s Webster pump station has completely transformed this mainline installation between Houston and Galveston, Tex.

A 100 per cent switchover has been made with six electric motors driving centrifugal pumps to handle some 90,000 bbl. of crude oil per day. Push-button control is now the order of the day. The station is provided with remote electronic gages which give the operator direct readings on the storage tanks.

Thermometer . . . A remote reading thermometer is also incorporated in the instrumentation of the station to simplify making temperature checks prior to pumping a tankful of crude. Elaborate warning and emergency shutdown devices are used extensively in the new setup.

Contrast between the old and new is brought sharply into focus by comparing pump installations. The eight diesel units taken out of service occupied a large brick pump house. This structure is the most imposing single item at the station. The six electric-driven units, meanwhile, are completely exposed and set in a line on a functional concrete slab.

2
GREAT NAMES ARE JOINED!
SEE PAGES
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for Monthly Stock Lists
● VALVES
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Peerless Supply Co., Inc.
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PATENTED
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are first choice because...

Unusually accurate bore due to "Know How" and advanced machining techniques.

Joints are "Hob Cut" to eliminate human error.

Precise machining not only meets but exceeds API specifications.

Each heat of steel checked for quality by separate test specimens.

High physicals insure inherent strength.

BAASH-ROSS makes Kellys in all sizes—all designs (square, hexagon and octagon) and all lengths... plus incorporating the most advanced construction and metallurgical features. No effort is spared to insure you that a B-R Kelly is the very best that money can buy.

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For further information write P.O. Box 1348, Houston 1, Texas or see The Composite Catalog.

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are superior...

Precise machining—API specifications exceeded.

High physicals developed by carefully controlled heat treats.

Rigid inspection during every phase of manufacturing.

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BAASH-ROSS Drill Collars are the top choice because specialized manufacturing techniques have been developed and perfected which are unsurpassed in the industry. Buy the best—in drilling and production tools—buy BAASH-ROSS.

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efficiency-balanced

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Heavy-Duty

Pipe Cutter

It's a tool that knows its business, that comes to your hands like an old friend. It rolls easily through any pipe or conduit, scarcely a trace of burr. Strongly built, guaranteed not to warp or break, always tracks perfectly. Thin-blade or heavy-duty cutter wheels (special wheels for stainless or cast iron). For pipe or conduit cutting that's a satisfaction, buy RIDGID's at your Supply House.

7 models for ⅛" to 6" pipe and conduit

RIDGID 4-WHEEL for easy cutting in tight places

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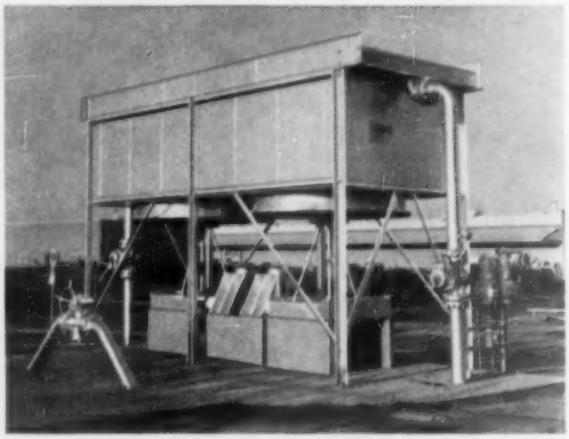
Work-Saver Pipe Tools

The Ridge Tool Company, Elyria, Ohio, U. S. A.

Young Engineering Talent

Designs Efficient Gas Cooler For Pipeline Compressor Station



Young HC-1807 gas cooler designed for moderate operating pressure (500 psig operating pressure, 800 psig design pressure). Its V-belt drive turns two 81" fans.

"HC" UNITS by Young

cool gas to proper temperature for pumping

At the Oklahoma City compressor station of the Oklahoma Natural Gas Company two "HC"—horizontal core—units made by Young Radiator Company are used to cool gas being fed through the pipeline. One of the units is shown above. A third Young-built "HC" cools engine jacket water, compressor jacket water, and lube oil cooling water for four 440 HP engine-compressors. The latter unit utilizes a single stream of water for all three services.

"HC" Heat Exchangers made by Young Lead in Efficiency, Economy and Versatility

These horizontal core units combine the *efficiency* of vertical air discharge, the *economy* of compact design, and the *versatility* of multiple unit combinations. They are especially practical for cooling water, oil and gases and for condensing steam and vapor.

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Put Young Talent to work for you . . .

Solving heat transfer problems is what we do best because it is our very reason for being. You, too, can harness the power of Young engineering talent. Write, wire or call without obligation.

HC is a registered trademark.

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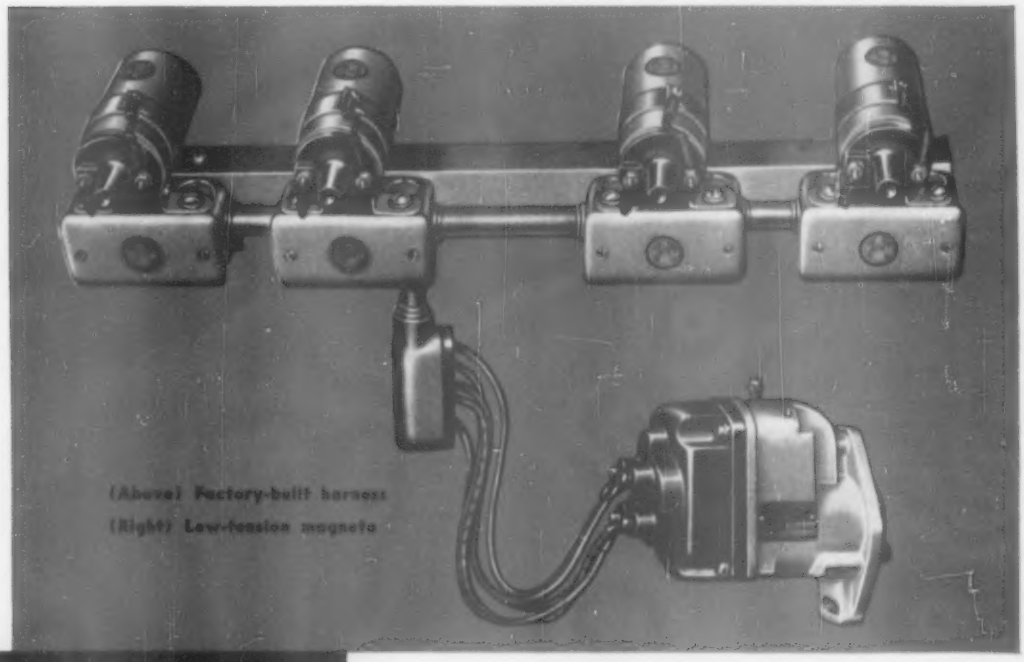
Heat Transfer Products for Automotive, Aviation and Industrial Applications. Heating, Cooling, Air Conditioning Products for Home and Industry.

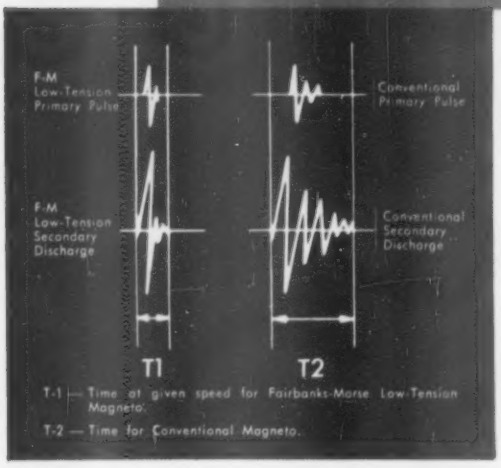
Executive Office: Racine, Wisconsin, Plants at Racine, Wisconsin, Mattoon, Illinois

New LOW-TENSION ignition systems

improved firing gives longer service on 1, 2, 4, 6, 8 - cylinder spark-ignited engines



(Above) Factory-built harness
(Right) Low-tension magneto

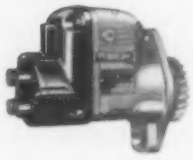

F-M Low-Tension Primary Pulse
Conventional Primary Pulse
F-M Low-Tension Secondary Discharge
Conventional Secondary Discharge
T1
T2
T-1 — Time at given speed for Fairbanks-Morse Low-Tension Magneto.
T-2 — Time for Conventional Magneto.

New model engines with their higher compression ratios, as well as thousands of engines already in the field, all show vastly improved performance with the Fairbanks-Morse low-tension ignition system. The short duration, high peak voltage spark liberates more than enough energy (heat) to ignite a full charge under all engine operating conditions.

Bearings and other magneto parts last longer because there is no problem with ozone or high corona discharges within the magneto case. In addition, a major improvement in spark plug life results from reduced electrode erosion due to the shortened voltage-time characteristic.

Fairbanks-Morse low-tension magnetos are no larger than standard units, thus simplifying installation. Complete factory-built harnesses that include transformers, junction boxes, mounting hardware, lead wires, etc. are available for nearly all popular engines up to 4000 cu in. in displacement.

MORE THAN 4,000,000 MAGNETOS IN USE



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A name worth remembering when you want the BEST

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PUMPS • MOTORS • SCALES • DIESEL LOCOMOTIVES AND ENGINES

Fairbanks, Morse & Co., Magneto Division
Beloit, Wisconsin

Please send Bulletin FM238A describing the Fairbanks-Morse low-tension ignition system.

Name_____

Company_____

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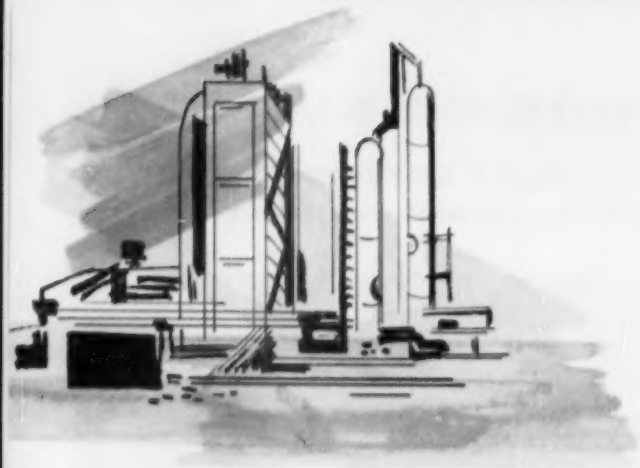
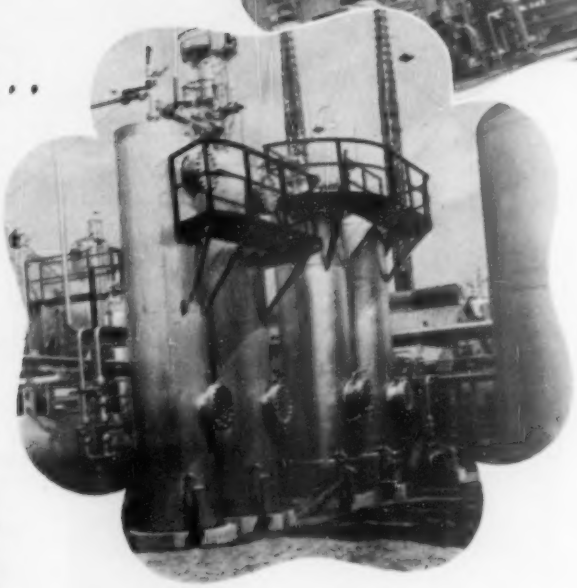
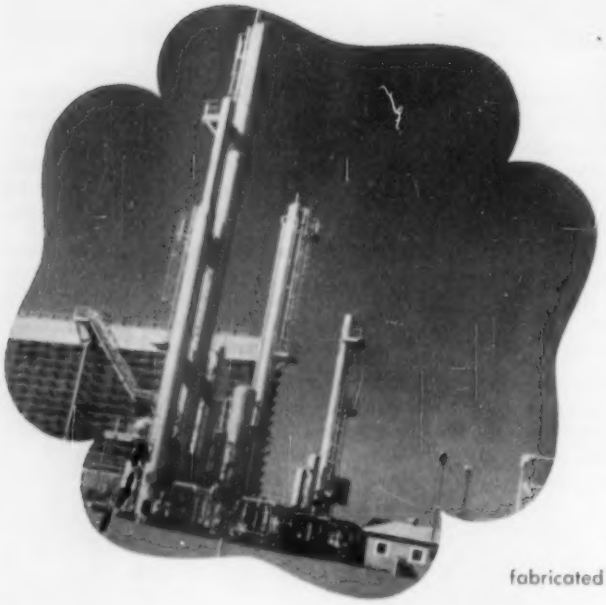


Signs of Quality...





Pictured above are three major installations fabricated by McNamar Boiler and Tank Company.

McNamar's quality products are designed for low maintenance operation, easy upkeep and are built to withstand years of rugged use.

Call, write or wire McNamar for further information concerning your individual needs.

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Tulsa, OKLAHOMA

EQUIPMENT MEN . . . in the News

Acme Oil Tool Opens New Branch at South Edmonton

A further expansion of Oklahoma City's Acme Oil Tool Co. and the promotion of Wayne Sanderson to manager of the new branch has been announced. Sanderson, who joined Acme as fishing-tool operator in 1954, has gone to South Edmonton, Alta., Canada, as manager of the tenth Acme or Acme-affiliated shop.

For 18 years Sanderson worked in the Southwest and Gulf Coast area. From 1948 to 1954 he was in Canada with the Lindley Drilling Co., returning to Oklahoma in 1954.

Home office of Acme Oil Tool Co. is Oklahoma City. Bill McFarland is president, Ed Walker vice president, and treasurer is Bill Warner.

SKF Elects S. H. Smith Vice President of Sales

S. H. SMITH

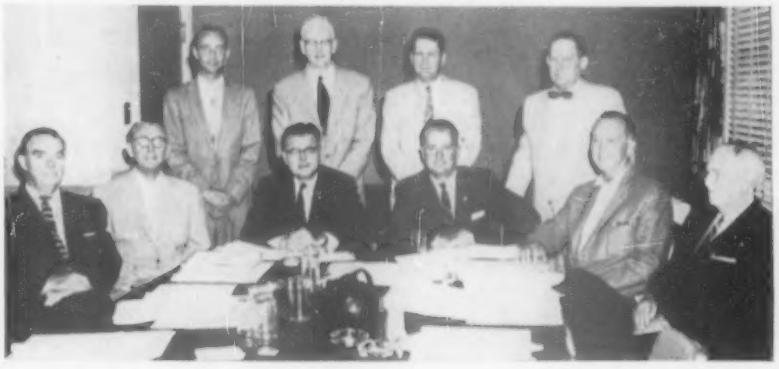
Stuart H. Smith of SKF Industries, Inc., has been elected by the board of directors to the office of vice president in charge of sales, according to Edwin R. Broden, president. Previously, he was general sales manager of SKF.

Smith has been with SKF in various sales capacities for 22 years. He began his career with the company as a sales representative in 1934. He was subsequently made assistant district manager of the Detroit district, district sales manager at Cincinnati, and in 1950 moved to Philadelphia as manager of industrial development. In 1951 he was appointed assistant sales manager, sales manager in 1952, and general sales manager in 1954.

Wolverine Tube Promotes Davies and Sheehan

Promotion of Rod T. Davies to the newly established post of manager of aluminum sales, and Jack Sheehan to manager of wholesaler sales has been announced by John M. Dumser, director of sales for Wolverine Tube, a division of Calumet & Hecla, Inc.

Sheehan will replace A. S. Kingerley who has been appointed assistant district sales manager of Wolverine's East-Central district.



BJ Tools Holds Regional Sales Managers Meeting

In attendance at the semiannual sales conference of the regional sales managers of Byron Jackson Tools, Inc., held recently in Fort Worth, were: W. C. Brooks, western region; C. F. Vincent, southern region; V. C. Horner, manager of sales; G. F. Nicolson, vice president and general manager; J. P. Magoffin, Rocky Mountain region; E. M. Rees, export manager; W. F. Roberts, Oklahoma City salesman; Ray Taylor, chief engineer, BJ-PB rubber products; T. W. Jurling, chief engineer, BJ oil tool products; R. J. Evans, Mid-Continent region.

During the meeting the group reviewed new BJ products and were familiarized with forthcoming advertising and sales-promotion plans.

Davies joined Wolverine in 1954 and has served as aluminum sales representative until his recent appointment. He will coordinate sales activities for both aluminum tube and extruded shapes and headquarter at Wolverine's general sales offices in Detroit.

Sheehan was formerly sales representative in the Louisville, Ky., area of Wolverine's East-Central district. He will headquarter in Detroit.

Building Tour and Awards Feature McKee Open House

An open house held by Arthur G. McKee & Co. was held recently in the company's main office in Cleveland, Ohio. The purpose of the event was to tour the headquarters building and the newly completed $500,000 metals division engineering building.

H. E. Widdell, president of Arthur G. McKee, left, presents service pins to Melvin E. Schulz and Harold Wiese.

The McKee company is a large engineering and construction firm specializing in the construction of oil refineries, chemical processing and industrial plants.

Lawlor Manages Holcombe's New Office in Tulsa

Edward W. (Red) Lawlor has been appointed manager of the newly created Tulsa office of The Holcombe Co., Inc., pipeline coatings distributors and manufacturer of corrosion-prevention materials. The new office is in the Mid-States Building. The area served by the Tulsa office includes Oklahoma, Kansas, Nebraska, Colorado, Missouri, Arkansas, and Illinois.

Active in the coatings field since 1934, Lawlor has made his headquarters in Tulsa since 1949.

RCA Contracts to Install Microwave Radio Systems

Reflecting the increasing industrial application of microwave radio communications, Radio Corp. of America has contracted for installation of microwave relay systems for three utility and pipeline companies, it has been announced by Russell C. Dubois, sales manager, RCA communications products department.

Dubois said that installations will begin shortly on radio systems for Atlantic Pipe Line Co., Philadelphia, Pa.; The Indiana & Michigan Electric Co.,

2
GREAT NAMES ARE JOINED!
SEE PAGES
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Fort Wayne, Ind., a subsidiary of American Gas & Electric Service Corp.; and El Paso Natural Gas Co., El Paso, Tex. The installations will utilize standard RCA CW-20A microwave equipment, operating in the 2,000 megacycle band.

SSC Promotes, Transfers Morris and Blackledge

Lauren G. Morris and Glenn E. Blackledge have been promoted by Seismograph Service Corp., Tulsa. Gerald H. Westby, president of SSC, in announcing the transfers, stated that Canadian seismic operations are being separated from logging operations. Morris will be manager of the Canadian seismic division and Blackledge will be manager of the logging division.

Morris joined Seismograph Service Corp. in 1947 as a trainee and later transferred to Canada as supervisor. In May 1956 he was transferred to the domestic division in Billings, Mont., as party supervisor.

Blackledge, until recently assistant manager of Seismograph Service of Mexico, has been employed by SSC since 1943. In that year he was transferred to the Venezuelan division as a party chief where he remained until his transfer to Mexico in 1948.

National Supply Appoints Ass't. Research Directors

Herbert L. Willke and Peter Tauson have been appointed assistant directors in the research and engineering depart-

H. L. WILLKE

PETER TAUSON

ment of The National Supply Co. The positions were created to strengthen the company's program of developing new and improved products.

Willke has been named assistant director of engineering and Tauson assistant director of research. The men will serve in Pittsburgh, Pa., under Joseph R. Mahan, director of research and engineering.

Willke joined the company in 1930 as a field engineer. In 1934 he was transferred from Houston to the Toledo, Ohio, plant and has been chief engineer there since 1946. Tauson started with National Supply in Kan-

USE KINZBACH WHIPSTOCKS TO SIDETRACK YOUR HEADACHES

Kinzbach Whipstocks can be set at any depth and require no support for the bottom. Positive setting slips prevent slipping or turning in the hole. The Kinzbach hinge arrangement assures that the top of the Whipstock will be close against pipe wall at all times, permitting easy passage of drilling tools. Setting trigger always locates the Whipstock between couplings so that the window will be within one joint. Kinzbach Whipstocks are available in all popular casing sizes through your supply store.

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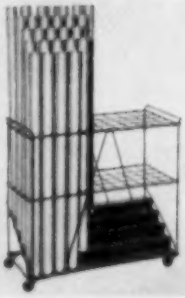
KINZBACH TOOL CO., INC. • P. O. BOX 277 • HOUSTON, TEXAS

FRONTIER® MAP RACKS

BUILT TO LAST!

handsome • compact • low cost



Welded all-steel mobile Map Rack, with ball-bearing casters, saves space and time. Graduated steps provide easy visibility. Kraft wrapped tubes protect maps. Baked-on black enamel finish. *Best Map Rack Buy.*

Standard Map Rack—MR-160
60 openings, each 2½". Shipping weight — 29 lbs. 33" wide, 14½" deep, 32" high.

Other Sizes:
30 and 100 openings, each 2½".
36 openings, each 3½".

Write for Descriptive Folder

FRONTIER MANUFACTURING CO.
11200 Harry Hines Blvd.
Dallas, Texas

Two-way Safety FOR FISHING, TESTING AND DIAMOND CORING OPERATIONS...

THE SHAFFER Oil-Sealed JAR SAFETY JOINT

. . . a two-purpose tool — *Up-Jar and Safety Joint* — in which all operating parts are sealed in oil — permanently protected against mud, sand and corrosion! Here are the highlights:

The Shaffer Oil-Sealed Jar Safety Joint offers all the "two-tools-in-one" features—and the many other advantages of the original Jar Safety Joint first developed by Shaffer years ago. It can be used in testing, fishing, diamond coring or other operations to deliver a sharp upward blow for freeing the string whenever it becomes stuck . . . and, as a Safety Joint, can be readily released in the event the string cannot be loosened.

Both these operations—Jarring and Releasing—are performed under the positive control of the operator, and either action can be selected at his discretion.

MECHANISM COMPLETELY OIL-SEALED

To protect the mechanism against the corrosive and abrasive actions of mud, sand and grit, all operating parts are now sealed in a chamber filled with clean oil. At even the greatest depths and highest fluid pressures, this oil-filled chamber prevents the drilling mud from contacting the internal mechanism of the Jar Safety Joint because the oil in the chamber automatically "balances" the varying hydraulic pressures in the well so that packing units are not subjected to excessive pressure differentials.

Result . . .

1. There is no change in "tonnage trip-off" or other characteristics as operating depths increase.
2. Abrasive mud, sand and grit—corrosive chemicals and salts—never contact the operating mechanism. This assures longer life, negligible maintenance.
3. The packing, not being subjected to excessive pressure differentials, lasts much longer and remains leak-proof at even great depths.

SET POSITION — TRIPPED POSITION

Other important advantages

In addition to its Oil-Sealed design, these advantages are also typical of the Shaffer Oil-Sealed Jar Safety Joint . . .

- Jarring action is automatic and positive. To deliver a sharp upward blow, it is only necessary to raise the string until tension is equal to the pre-set tripping load of the tool, whereupon the blow is struck. Lowering the string again re-sets tool for another blow—and repeated blows can be struck as fast as the string can be raised and lowered.
- Only *straight pull* is necessary to operate the tool. No torque or other secondary operations are needed—particularly important on fishing, testing and similar strings where light connections are used.
- The force of the blow is absorbed by integral knocker heads built into the tool—not by easily-damaged drive-keys or threaded elements.
- The Shaffer Oil-Sealed Jar Safety Joint does not depend upon friction for its tripping action. Therefore the tool is not subject to variable operating characteristics. Its action is dependable, uniform, fool-proof!
- The Safety Joint portion has important advantages over conventional safety joints. No threads are used in the releasing mechanism—therefore there's no risk of overtightening by torque. Nor is there risk of accidental release by reverse rotation. Yet when simple releasing procedure is followed, *the tool releases with less than ¼ turn at the tool!*

There are many other advantages. Get the full story by sending for booklet at lower left.

Get The Complete Story on this important Shaffer advancement by sending for this 8 page descriptive booklet. It contains cutaway views of the tool showing the oil-sealed construction and explaining how the tool operates without depending upon friction for tripping . . . gives application details for the tool . . . full dimensions of the various tool sizes, together with exploded views of parts, etc. Or see our nearest Shaffer representative for details.

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EXPORT SALES OFFICE, Shaffer Tool Works, 500 Fifth Avenue, New York, N. Y., U. S. A.

34 years OF OIL TOOL LEADERSHIP

sas. He did much of the hydraulic engineering for the company's line of heavy-duty torque converters.

Major Oil Companies Buy RCA Automatic Uncasers

Sales of automatic uncasing and sorting machines to Cities Service Oil Co., Gulf Oil Corp., and Sinclair Refining Co. have been announced by Radio Corp. of America.

The sales mark the first application in the petroleum field of the automatic machine which is widely used in other industries, according to Ralph A. Teare, manager, RCA industrial products.

The automatic uncaser-sorter unpacks new cans from their cases, arranges them with open ends aligned, and lines them single-file for filing—all at speeds up to 600 quart-size and 1,000 12-oz. cans a minute.

Cities Service has purchased an uncaser for installation at its Cicero, Ill., compound plant. Gulf Oil will install a unit in its Port Arthur, Tex., refinery. Sinclair Refining has ordered two uncasers for its plants in Marcus Hook, Pa., and East Chicago, Ind.

ANOTHER NEW
Major Oil Company
Loading Rack in Action . . .

operating with OILCO
LONG-RANGE LOADER
No. 462

To meet the requirements of the industry—distributors, bulk plants and marketers—Oilco has perfected this assembly of extreme long range—a new loader which, without re-spotting, loads transports and tank cars in a jiffy. No intricate mechanism. It does its work quickly, easily and efficiently.

This Spring-Matic assembly includes No. 150 self-closing, shock-proof loading line valve, and two Model 857 swing joints equipped with TIMKEN tapered roller bearings to insure positive alignment and greater friction-free load capacities.

The above illustration shows a new, modern installation employing 24 of these new Spring-Matic loaders on two racks, performing the job for which it was intended and doing it well.

Write for Folder A-7 for complete description

OIL EQUIPMENT MANUFACTURING CO.
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Ceremony Heralds Plant Expansion by Aero Design

Aero Design & Engineering Co., manufacturers of the Aero Commander executive airplane, announced expansion of its Oklahoma City facilities at a ground-breaking ceremony held recently. The new plant will be located on 44 acres south of Tulakes airport in Bethany, a suburb of Oklahoma City.

Shown here are R. T. Amis, Jr., president of Aero Design; Allen Street, mayor of Oklahoma City, at the controls while breaking ground for the new factory; and G. T. Pew, board chairman of Aero Design.

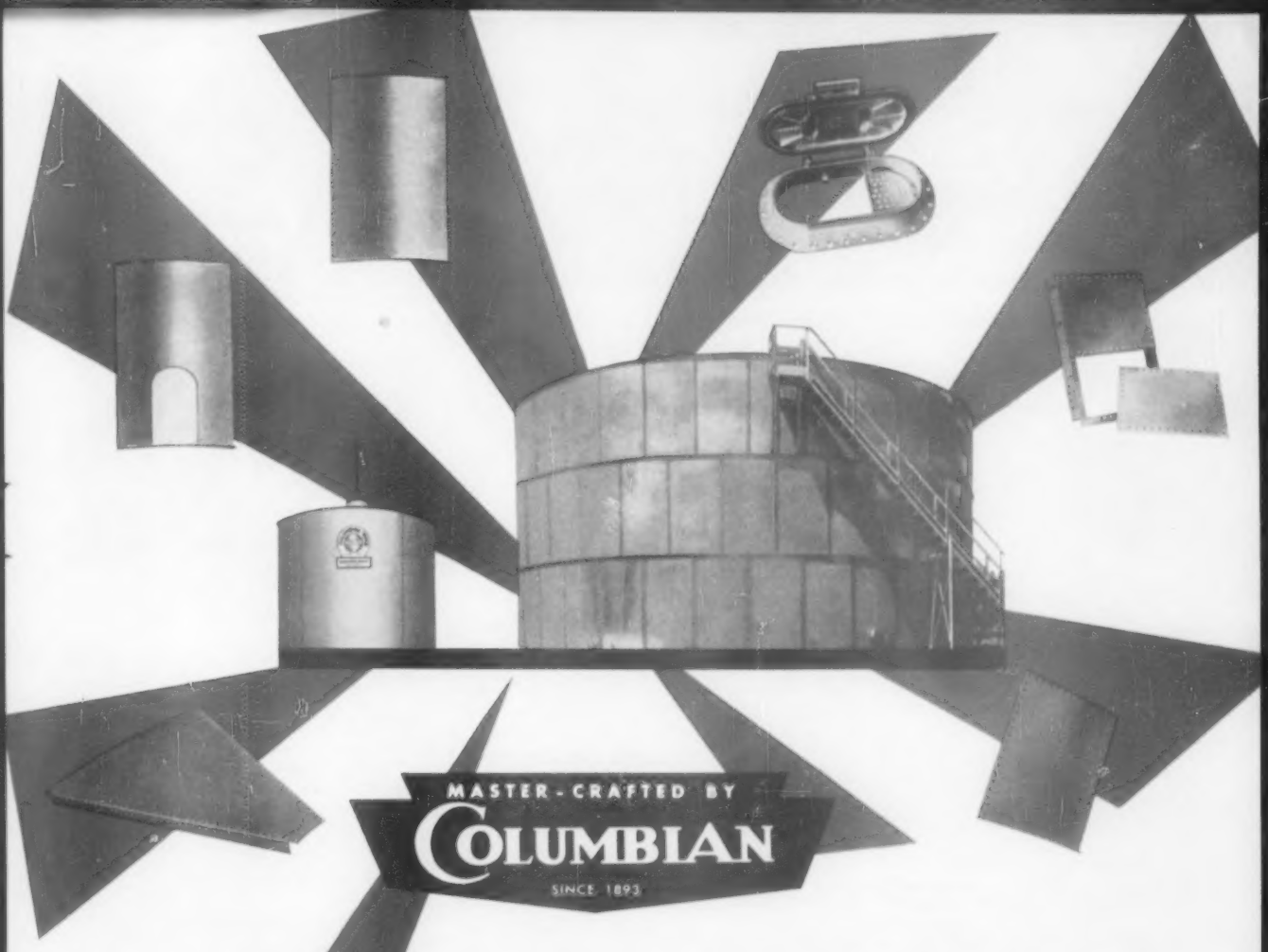
Construction of the 1½-million-dollar factory, to be started immediately, will provide an additional 126,000 sq. ft. for Aero's aircraft production work. Plans call for moving the entire air frame construction activities from the old plant on Tulakes airport to the new plant which is expected to be ready for operation by August 1957. The present facilities will continue to be used. The aircraft, when constructed, will be towed from the new plant to the old plant for modification and flight-test operations.

Burgess-Manning's Penn Instruments Appoints

R. J. Medkeff was named chief engineer, William Melas, consulting engineer, Adalbert Melas, service manager, and Clifford C. Harris, assistant secretary, of Penn Instruments Division of Burgess-Manning Co., Philadelphia.

Medkeff was with Askania Regulator Co. from 1950 until April 1956, when he came to Penn Instruments as chief development engineer. William Melas joined Cochrane Corp. in 1926 and was chief engineer of the instrument department when the instrument division became Penn Industrial Instrument Co.

Adalbert Melas has been associated with the manufacture of industrial instruments since 1940. During the past 5 years he was in charge of all calibration work for Penn Industrial Instrument Co. prior to its acquisition by Burgess-Manning. Harris was chief accountant of Penn Industrial Instru-



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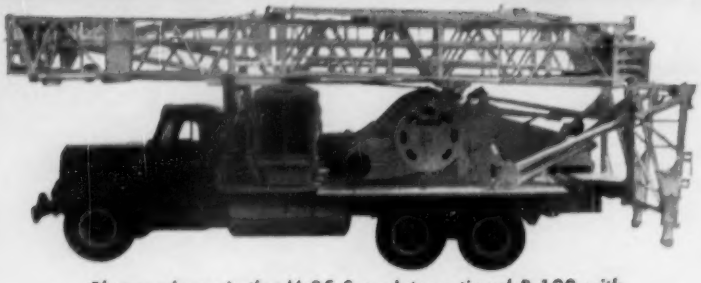
Truck Rambler
WITH GUYLESS KWIK-LIFT MAST AND AIR-CONTROLLED HOIST



Shown above is the M-25-S on International R-190 with independent power unit and KM-65-100 D(H) guyless mast

Faster . . TO THE JOB . . ON THE JOB

Here is the world's most modern and efficient well servicing rig — already field-proved from the Gulf to Canada. Let your Ideco man show you why the Ideco Truck Rambler is setting new standards in equipment of its type.

POWER:

- "Uni-Power" design utilizes truck engine for both propulsion and rig operation through 5-speed mechanical transmission or torque converter.
- Independent power unit on integral skid with hoist also available for truck mounting.

HOISTS:

- Choice of 5 sizes with h.p. input ratings up to 145, 200, and 240. Single or double drum.
- Air controls grouped in single panel at hoist.
- High and low main drum air clutches mounted outside hoist frame for convenient maintenance.
- Precision heavy-duty roller chain on all drives . . . alloy steel sprockets with machined, hardened teeth.
- Heat-treated steel shafts mounted on self-aligning roller bearings; clutch sprockets on ball bearings.

MASTS:

- 65-ft. "D" and "C" or 89-ft. "C" telescoping Kwik-Lift masts . . . Model "D" internally guyed or "C" externally guyed.
- Pole type mast specifications available on request.

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ment Co. prior to the acquisition by Burgess-Manning Co.

Win-Well Appoints Baeten and Osborn

The appointment of C. J. Baeten, Wichita, Kans., and G. H. Osborn of Edmonton, Alta., as sales representatives for the new Win-Well 7-way multiport selector valve has been announced by Win-Well Manufacturing Co., Los Angeles.

C. J. BAETEN

G. H. OSBORN

During the past 19 years Baeten has been engaged in the sale of oilfield equipment. Earlier in his career he worked in the transportation, production and pipeline phases of the oil business. Associated with Baeten in representing Win-Well will be C. W. (Cy) Miller of Great Bend. The Baeten organization will handle Win-Well sales and service in Kansas and western Missouri.

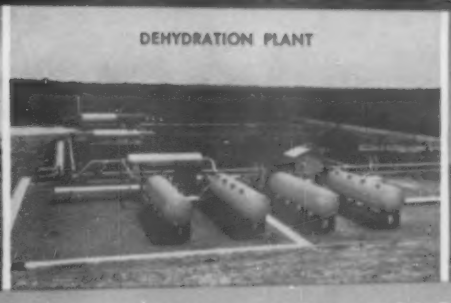
Osborn has had experience in engineering and sales phases of the pipeline-equipment business and has served as a manufacturer's representative in western Canada. He will be the sales-service representative for Win-Well in the Canadian area.

Crane Co. Names Elliott Chairman of the Board

Frank F. Elliott has been named chairman of the board of directors of Crane Co. and will be succeeded as president of the company by Neele E. Stearns, currently vice president for planning and development of Inland Steel Co.

Elliott has been president of Crane Co. since June 1955. He joined the organization in 1922 as a sales engineer and in 1928 was named sales manager at Los Angeles. He subsequently served as sales manager, assistant manager and branch manager at San Francisco, and became western district manager in 1943. He moved to Chicago as vice president in charge of branches in 1951 and became senior vice president of sales in 1952.

Stearns has been with Inland Steel Co. since 1940. In 1949 he went to Inland Steel Products Co. as executive vice president and later was elected



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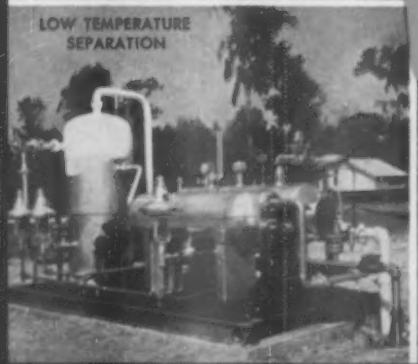

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"wherever there's oil, you'll find BS & B"

2 Safe Ways to PROTECT Pressure Piping...

W-S SCREW-END and SOCKET-WELDING FORGED STEEL FITTINGS

Pipe joints are potential trouble spots in high pressure piping systems. Change in direction of flow causes turbulence, erosion and vibration. Watson-Stillman fittings are made to absorb this type of punishment. They're drop-forged for strength and toughness and safety-factor designed for the protection of your piping.

Choose between a welded piping system and a screwed one to suit your needs. Then choose W-S Screw-End or Socket-Welding Fittings to join your pipe. They're available in sizes ⅛" to 4" for piping up to 6000 lb. W.O.G. class. For high temperature or corrosive service you can get W-S Forged Stainless and Alloy Steel Fittings, too. Send today for our informative catalogs.

W-S FITTINGS DIVISION

H.K. PORTER COMPANY, INC.

Roselle, New Jersey

president of the subsidiary. He was appointed vice president in charge of long-range-planning activities at Inland in 1953; was elected assistant to the president in January 1956; and was named to his present position with Inland in October 1956.

Anchor Petroleum Makes West Coast Changes

Clyde H. Cornell has been named manager of Anchor Petroleum Co.'s San Francisco office, and Robert C. Ockerman is manager of the Long

C. H. CORNELL

R. C. OCKERMAN

Beach office. These appointments were announced by W. A. Baden, president.

Cornell has been with Anchor 2½ years after 6 years' experience in natuarl - gas - engineering and equipment sales. Ockerman has been with Anchor 4 years. He spent the previous 9 years as a department manager at the plant and laboratory of Wilmington Gasoline Co.

Homco Makes Personnel Changes and Transfers

Thirteen personnel promotions, changes and transfers have been announced by Houston Oil Field Material Co., Inc. Donald R. Atkins, directional engineer has been transferred from Houston to New Iberia, La.; Alton D. Breedlove, sales, from Pearsall to Carrizo Springs, Tex.; A. F. Coleman, from service, Sherman, Tex., to fishing-tool supervisor, Houston.

George E. Coleman, from Odessa to Farmington, N. M.; Talley M. Dosier, from fishing - tool supervisor, New Iberia, La., to district manager, Morgan City, La.; N. W. Follis, from Houston to Liberty, Tex.; James J. Gross, from Sherman to Kenedy, Tex.

B. C. Matthews, from fishing tool, Casper, Wyo., to fishing-tool supervisor, Louisiana and Mississippi; J. D. Nelson, from fishing - tool supervisor, Victoria, Tex., to field service representative, Houston.

George M. O'Leary, from detail draftsman to engineer trainee. Houston; John C. O'Leary, from detail draftsman to engineer trainee. Houston; James E. White, Jr., from project

New facts about

RAYFLO THE UNIVERSAL DISPERSANT

now made in the U.S. *and*

at a new $1,250,000 plant in Canada!

RAYONIER INCORPORATED *cellulose chemistry*

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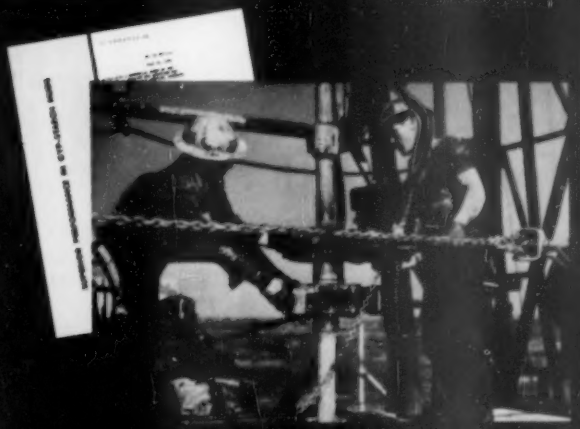
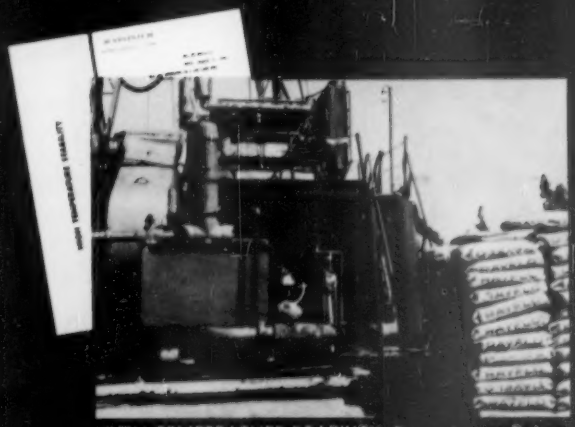
TESTED IN THE LABORATORY! PROVED IN



SUPERIOR PERFORMANCE IN GYP-STARCH MUDS. Rayflo proved in Williston Basin finding increasingly wide application there.



HIGH TEMPERATURE STABILITY. Proved near Bakersfield, California confirming previous laboratory findings . . . used extensively ever since!

Rayflo is th

Outperforms All Other Mud Dispersants

Some Questions and Answers About Rayflo

Who Makes Rayflo? Rayonier—a leading world chemical cellulose producer—at one of its six U.S. plants and at a new $1,250,000 plant at Vancouver, B. C., operated by its Canadian subsidiary, Alaska Pine & Cellulose Limited.

What Is Rayflo? A silvichemical made to rigid standards from residuals of cellulose production. A dark, reddish-brown, completely water soluble powder; chemically, a polyphenol derivative. Rayflo is a dispersant that offers new advantages

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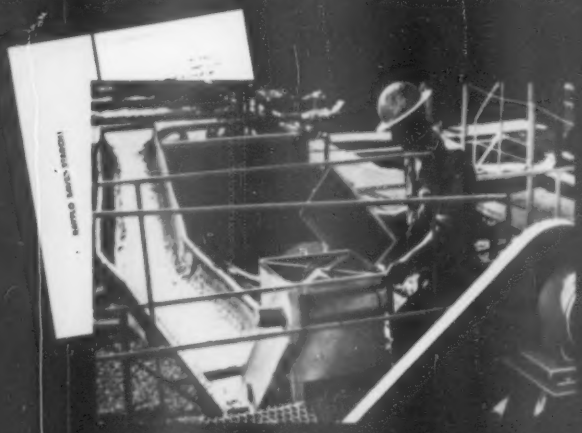
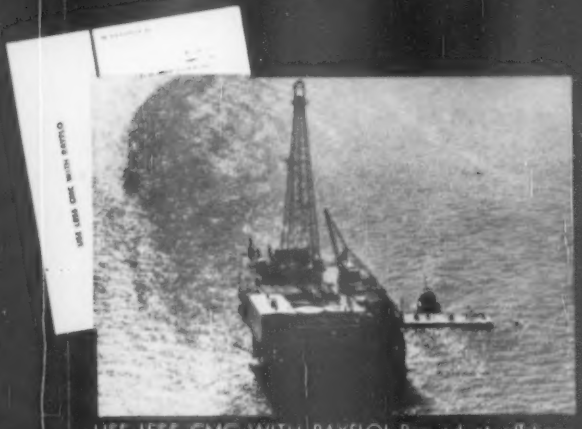
... IN THE FIELD! — ACCEPTED WORLD-WIDE!



RAYFLO SAVES STARCH. Proved in fields of Alberta, Canada; . . . and used extensively ever since! Lower fluid losses found possible with less starch.

RAYFLO RESISTS SALT CONTAMINATION. Proved in Southeast Texas . . . used extensively ever since! Lowered chemical costs give maximum performance.



USE LESS CMC WITH RAYFLO! Proved at offshore sites in the Gulf of Mexico. Especially economical in salt-water muds. Used extensively ever since!

RAYFLO EFFECTIVE IN LOW LIME MUDS. Proved at wells in the Ventura, California area; showed exceptional performance even with low-yield clays; . . . used extensively ever since!

New Lab and Field Studies Show

the true Universal dispersant

...rsants . . . Cuts Drilling Costs Effectively!

to tool pushers, contractors, well drillers and operators.

Is Rayflo Uniform? Yes! Each bag is consistent—one just like another. It's completely effective, even under conditions of low alkalinity! Resists salt, gypsum and cement contamination; controls properties of sea-water mud; is an excellent oil emulsion stabilizer too.

What About Availability? A forest product, Rayflo is in perpetual supply. Being domestic, Rayflo isn't subject to uncertainties of foreign economic conditions.

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Contains complete Rayflo research reports

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New Services • • • New Tools • • • New Methods • • • Outstanding Results

McCullough Back-off Service Simplifies Fishing Job

Enables Fastest Possible Recovery of Cemented-in Tubing String

While this wildcat was being completed, a packer and 2⅛" tubing were cemented in the 7" O.D. casing by error. The productive sand which was to be tested lay at 7,660'.

Faced with a tough pipe recovery job, the operator called for McCullough Back-Off Service. The Magna-Tector was run and located the lowest free point at 7,449' and the nearest collar that could be backed off at 7,430'. The entire zone to be tested had been cemented-in.

Next, a McCullough String Shot was run which loosened the collar at 7,430'. Tubing was backed off and removed from the well. The balance of the tubing was washed-over and cut out, permitting the operator to complete his well program in the fastest possible time.

The entire back-off job was completed in only three hours rig time and was done in 25° below zero weather.

Due to the accuracy and reliability of McCullough Back-Off Service, all free tubing was recovered on the first try. Also, the balance of the fishing job was minimized to the point where it could be completed with the least possible expense and loss of rig time to the operator.

Magna-Tector Helps Recover An Extra 3680' of Casing

McCullough Magna-Tector and Jet Casing Cutter Slash Abandonment Costs by Recovering 61% More Casing Than Expected

Substantial savings were realized by this Wyoming operator in the abandonment of an 11,000' well. McCullough's Magna-Tector accurately located the stuck point, indicated that the pipe might be freed to greater depths, then confirmed the progressive loosening of the string as the pipe was worked.

Casing was 7" O.D. 29 lb. N-80. A temperature survey located the top of the cement at 7,550'. The operator was expecting to recover a maximum of 6,000' of casing and called McCullough to exactly locate the lowest free point at which it could be cut.

On the first run of the operation, the Magna-Tector found the casing stuck at 5,000' and cutting the pipe at that depth was considered. However, since the Magna-Tector indicated that the casing might be freed still deeper by working, the operator decided to give it a try.

The pipe was worked for two hours. Periodic checks by the Magna-Tector showed the casing was loosening progressively deeper, until finally the string was free at 9,700'.

A 7" McCullough Jet Casing Cutter was run and the cut made at 9,680'. Total rig time on the job was only six hours.

Guesswork in pipe recovery operations is entirely eliminated by the use of the McCullough Magna-Tector (Free Point Finder). It quickly and accurately locates the lowest free point from which pipe may be recovered. It may also, as in this case, indicate that working the pipe will free it to greater depths.

A bonus of an additional 3,680' of useable 7" N-80 casing was no small saving on this job.

RECOVER ALL FREE PIPE....

When pipe is stuck, call for the McCullough Magna-Tector (Free Point Finder). Locates lowest free point, accurately and in a hurry. Paves the way for fast recovery of all free pipe and speeds up remaining fishing operations. You save money, rig time and recover more pipe.

McCullough® TOOL COMPANY

Cable Address: MACTOOL

LOS ANGELES
HOUSTON
EDMONTON

engineer to senior project engineer, Houston; Lewis Wilson, from Houston to Harvey, La.

Wallace Named Ross Field Application Engineers

G. M. Wallace & Co. has been appointed field application engineers for Ross Heat Exchanger Division of American-Standard. Wallace will represent the division in Colorado, Wyoming, Montana, Utah, New Mexico, eastern Nevada, southern Idaho and western Texas, through its main office in Denver, Colo., and its other offices in Salt Lake City, Utah, and Butte, Mont. Personnel in charge include G. M. Wallace at Denver; R. E. Kunkel at Salt Lake City; and Paul Le Veaux at Butte.

SSC Contracts for Gravity Survey Work in Boliva

Seismograph Service Corp., Tulsa, has signed a contract with Bolivian Gulf Oil Corp. for gravity survey work in Bolivia. Gerald H. Westby, SSC president, said the crew will leave Tulsa soon to begin the project. M. W. Tyrrell will head the crew.

The awarding of the contract brings to 14 the number of SSC crews in South America. The company has 11 seismic crews and 2 velocity-logging units assigned there, in addition to the gravity survey crew.

Seismograph recently announced the award of two other exploration contracts in Venezuela and Brazil.

Wyatt Fabricates Reactors For Magnolia Plant

Spherical reactors, required for new Sovaformer catalytic refining process, were fabricated in the Houston plant of Wyatt Metal & Boiler Works for installation in the Magnolia Petroleum Co. plant at Beaumont, Tex.

Welding pressure vessels as spheres called for special procedures. The 2⅝-in. special plate was cut into gores and other shapes, which while hot were shaped to proper contour under hydraulic pressure.

Later each vessel was fitted by temporary shafts so it could be rotated for adding flanged opening and other accessories. Stress-relieving was accomplished by covering each vessel with insulation and heating from the inside.

Homco Moves Sales Dept. To Bank of the Southwest

The majority of space on the twenty-fourth floor of the Bank of the Southwest Building in Houston has been acquired by the sales department of Houston Oil Field Material Co., Inc., George Bean, director of sales, has announced.

Other sales officials who have offices in the new quarters in addition to Bean are R. M. Freeman, general sales manager, and Otho Meadows, manager of Houston city sales.

Tubular goods and machinery sales also are being handled from the Bank of the Southwest Building. W. B. Stallings heads the tubular-goods section, and George Haltom is manager of machinery sales.

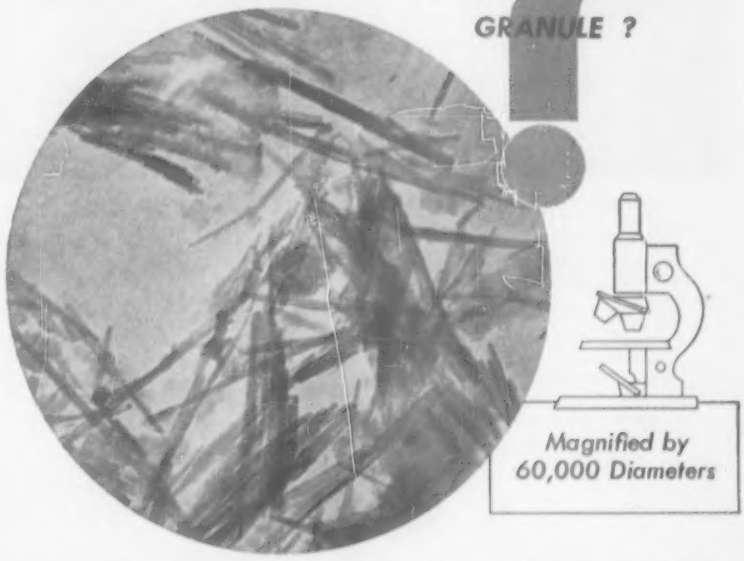
Other Homco personnel in the new quarters are City Sales Representatives Ed Herron, H. L. Lodge, John A. Watson, J. V. Kelly, Russell Smith, P. C. Roten, and Hewitt N. Clark; D. C. Wiggins, assistant manager of tubular goods; L. T. Shackleford, city sales representative for tubular goods; Charles Holmes, chief clerk for tubular goods; Charles Riker, machinery sales representative; Richard Parker, sales engineer.

Representing directional drilling,

EVER LOOK INSIDE A

Florex?

GRANULE ?



The fibrous nature of Florida Fullers Earth, commercially available as Florex, reveals each unit consisting of about 2200 molecules in a bundle, providing ready selectivity in adsorption of color and contamination from organic and inorganic liquids and gases.

Florex quality means specially processed fullers earth giving maximum surface area and adsorption efficiency. Florex is unequalled in high quality or low cost for processes involving the use of highly active clay for sweetening light distillates, dehydration, desulfurization, and polymerization.

Standard meshes from 2/4 to 200/up and our experienced adsorption specialists are available to help you solve complex laboratory or production problems.

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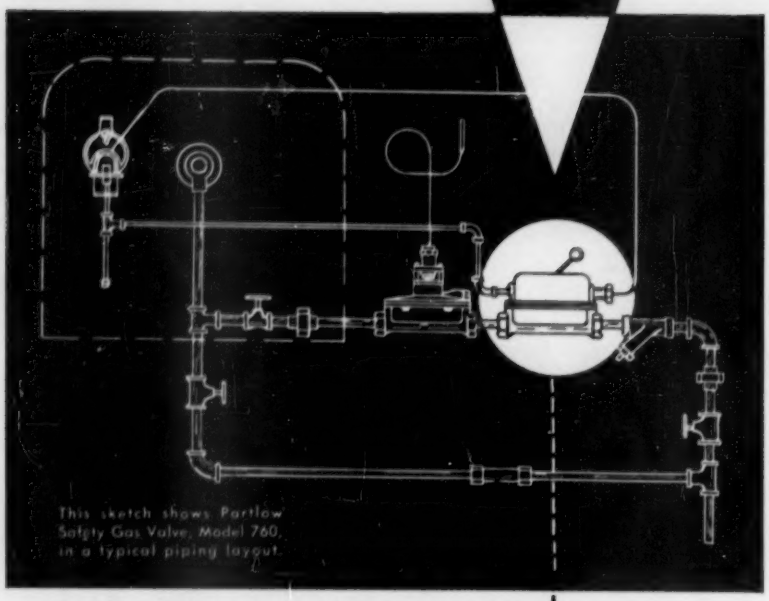
Here's **positive protection** against gas pilot failure



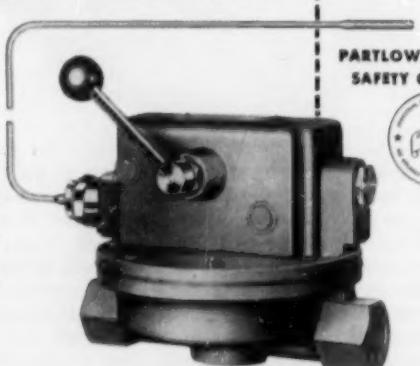
The Partlow Safety Gas Valve is ideally suited to oil field applications. *It's thermally operated . . . requires no electrical connections.*

This combustion safeguard gives positive protection to gas-fired appliances . . . prevents damage from gas pilot failure.

Rugged valve opens only after mercury actuated element becomes red hot from contact with pilot flame. If pilot goes out, element cools and releases a latch, causing valve to snap shut.

No conventional slip stem to corrode and stick. Strong perforated diaphragm guides valve disc to its seat.

PARTLOW MODEL 760 SAFETY GAS VALVE



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partlow

the pioneer in mercury thermal controls

Offices in All Principal Cities

fishing, and cutting, electrical well services and manfactured sales products are Bob Dilworth and D. U. (Doc) Skinner.

Continental-Emsco Named Distributor by Fibercast

The Fibercast Corp. has announced the appointment of Continental-Emsco Co. as oil-field distributors of its Fiber-

H. D. BOGGS

J. HUTCHISON

cast line pipe and well tubing. The Fibercast Corp., Sand Springs, Okla., is a subsidiary of The Youngstown Sheet & Tube Co.

Also announced was the current expansion of the plant at Sand Springs to increase production of both line pipe and well tubing. H. D. Boggs is general manager of Fibercast and Jerry Hutchison is sales manager.

Continental-Emsco Co. operates stores and offices in all major oil fields, with general offices in Dallas.

A. O. Smith Board Elects Three New Officers

Named as vice presidents of A. O. Smith Corp. are U. T. Kuechle and Roy A. Dingman. Robert A. Rietz has been named assistant secretary.

Kuechle, who joined A. O. Smith in 1929, has been automotive general sales manager since 1954. Dingman joined the company in April 1956 as director of industrial relations. Rietz came to A. O. Smith in 1948.

Kaiser Steel Makes District Appointments

A. L. Peake has been appointed assistant manager of Kaiser Steel Corp.'s central district sales office in Oakland, Calif., according to C. L. Emerson, general sales manager. He succeeds Mark Anthony, recently named assistant to the vice president and general manager of Kaiser Steel. Fred G. Brear succeeds Peake as assistant sales manager in the southern district sales office in Los Angeles.

Peake joined the sales department of Kaiser Steel at the Oakland office in 1948. He was named assistant man-

OVER 3/4 MILLION HOLE FEET

Without a MAJOR OVERHAUL!

DON R. ALLEN
Driller

EARL POWELL
Field Engineer

J. L. CAPPS
Field Engineer

JACK FREEMAN
Chief Engineer

W. L. HODGES
Superintendent of Drilling

Here's proof Failing rigs give more trouble-free service . . . the record of a 1500-S Failing rig drilling near Corsicana, Texas. This rig has drilled over 750,000 feet without a major overhaul!

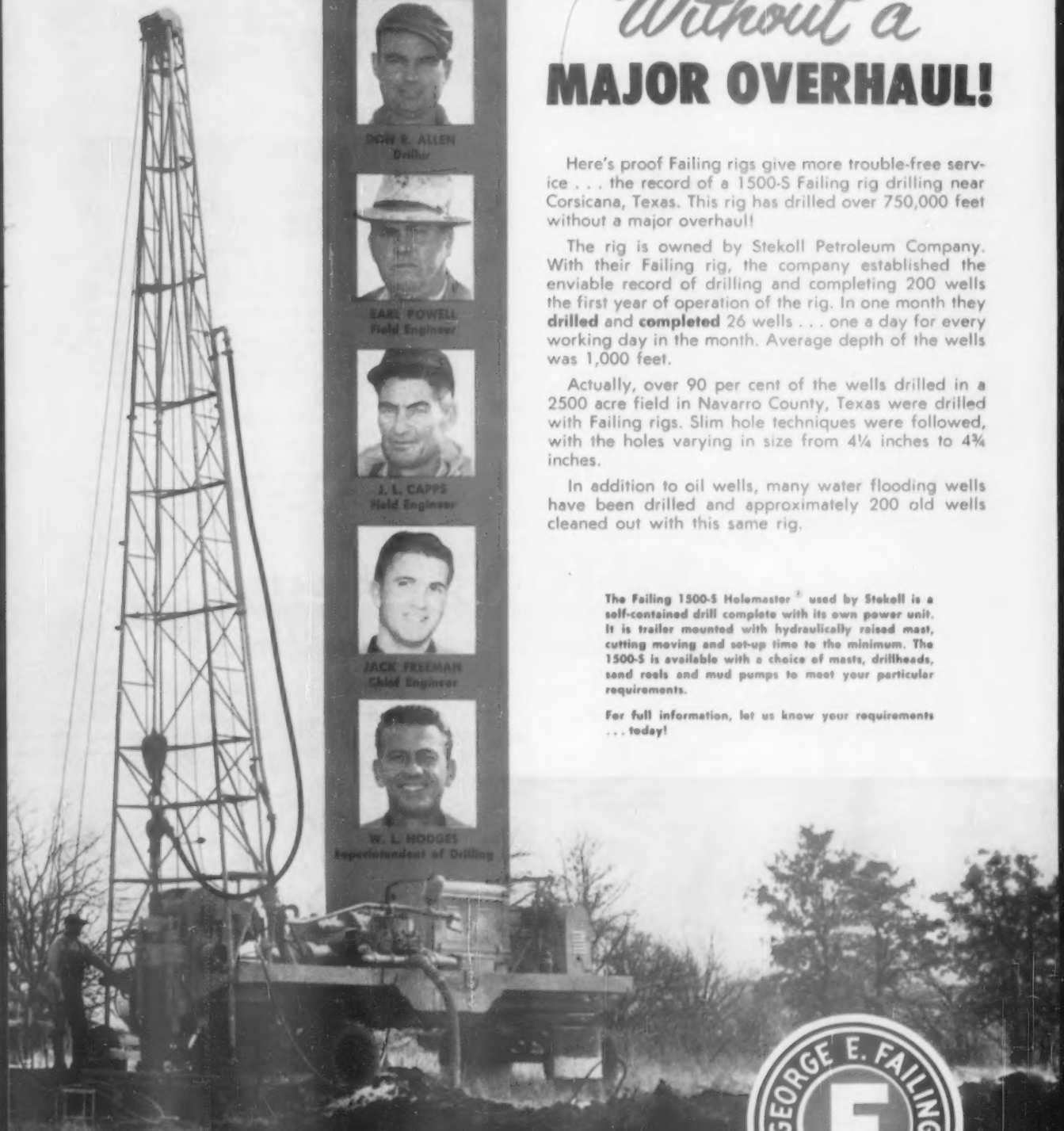
The rig is owned by Stekoll Petroleum Company. With their Failing rig, the company established the enviable record of drilling and completing 200 wells the first year of operation of the rig. In one month they **drilled** and **completed** 26 wells . . . one a day for every working day in the month. Average depth of the wells was 1,000 feet.

Actually, over 90 per cent of the wells drilled in a 2500 acre field in Navarro County, Texas were drilled with Failing rigs. Slim hole techniques were followed, with the holes varying in size from 4¼ inches to 4¾ inches.

In addition to oil wells, many water flooding wells have been drilled and approximately 200 old wells cleaned out with this same rig.

The Failing 1500-S Holemaster ® used by Stekoll is a self-contained drill complete with its own power unit. It is trailer mounted with hydraulically raised mast, cutting moving and set-up time to the minimum. The 1500-S is available with a choice of masts, drillheads, sand reels and mud pumps to meet your particular requirements.

For full information, let us know your requirements . . . today!



GEORGE E. Failing COMPANY

A Subsidiary of
WESTINGHOUSE AIR BRAKE COMPANY
ENID, OKLAHOMA, U. S. A.

GEORGE E. FAILING COMPANY ®

ager, rolled steel products, in 1952, and moved to the Los Angeles position in 1954.

Brear has been with the sales department since 1949, first at the company's home office in Oakland and later in Los Angeles. He was named assistant service manager, southern district sales, in 1951, and was promoted to service manager a short time later. He has been a southern district sales representative since 1952.

Sivalls Appoints Perry As Research Engineer

Charles R. Perry has been appointed research and development engineer for Sivalls Tanks, Inc., Odessa, Tex. According to I. W. Lovelady, president, Perry will develop and test new products and new services for the oil, gas, and petrochemical industries.

Perry joined Sivalls Tanks in May 1956. He has trained in the company's Odessa fabricating shop, with the tank-setting crews, in the field-service section and with the company's subsidiary, Control Equipment, Inc. He has worked on the spherical metering separator and on other equipment relating to automatic custody transfer and other elements of automation.

Standard-Southern Corp. Opens Louisiana Office

Gerald Rauch, president of Standard-Southern Corp., has announced the opening of a sales office in Baton Rouge, La. The company is planning a warehouse operation in Louisiana within the next 6 months.

Ben Poelking will be in charge of the Baton Rouge office. He comes to Standard-Southern Corp. from the purchasing department of Bechtel Corp.

The main office of Standard-Southern is in Houston, with warehouses in Beaumont, Houston, and Odessa. Other sales offices are in Dallas and Midland.

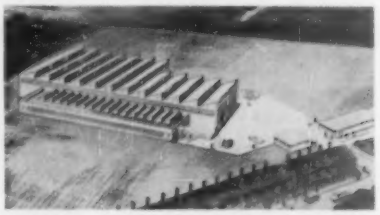
Porter Will Build Plant In Pascagoula, Miss.

H. K. Porter Co., Inc., has announced plans to build a chemical plant in Pascagoula, Miss., to produce magnesia and basic refractory products. The cost of the plant is estimated by T. M. Evans, president, at $8 million and completion is scheduled for early 1958.

The plant will be located on a 400-acre tract on the proposed deep-water channel currently being constructed by Jackson County Port Authority of Pascagoula. The new channel will provide docks and access to ocean-going vessels.

The Porter company has 12 divisions manufacturing industrial products. Most of the output of the new plant will be handled by Porter's two refractory divisions, Laclede-Christy at St. Louis and McLain Fire Brick in Pittsburgh.

Cameron Begins Foreign Expansion Program



Cameron Iron Works, Ltd., of Leeds, England, subsidiary of Cameron Iron Works, Inc., Houston, has started construction on this new 45,000-sq.-ft. factory, warehouse, and office-expansion facility. The new plant is expected to be in full operation by September 1957.

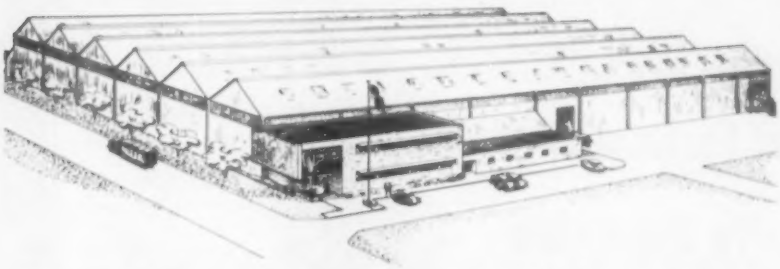
John Grubb, manager of Cameron's international division, in making the announcement, stated that the new plant will be located on a 10-acre tract at Stourton, near Leeds. Plant superintendent will be Edward E. Parker, who has been with Cameron since 1941 and has served in Cameron's Houston plant.

AT THE WELL—W-K-M Through-Conduit, parallel expanding gate valves on christmas trees, flow wings, high pressure flow lines, etc.

IN THE FIELD—OCT Rectangular and Round Port lubricated plug valves on manifolds, headers and flow lines serving field processing units.

IN THE PLANT—W-K-M valves on feed lines to gasoline and cycling plants, refineries, chemical, petro-chemical and processing plants.

Vinson Supply Builds Houston Office, Warehouse



Vinson Supply Co., headquartered in Tulsa, has a new facility under construction in Houston which will provide sales offices and warehouse space. The announcement was made by Bailie W. Vinson, chairman, and J. M. McReynolds, president.

Located on a 9-acre tract, the warehouse covers an area of 152,000 sq. ft. Totaling 13,500 sq. ft. in area, the office building will house the local offices of the company. Construction work is nearly finished on the warehouse, and it is expected the office building will be ready for occupancy in January 1957.

John Heinzerling, vice president and Gulf Coast manager for Vinson Supply, has headed the company's activities in Houston for several years.

Hills-McCanna Names Distributors, Agents

Hills-McCanna Co., Chicago, has announced the appointment of Neptune Supplies, Inc., New Orleans, La., as exclusive stocking distributor for diaphragm valves and replacement parts in eastern and southern Louisiana. Neptune Supplies will maintain stocks of valves and replacement parts in New Orleans and Baton Rouge.

Hayes Pump & Machinery Co., Somerville, Mass., has been appointed exclusive representative for Hills-McCanna chemical metering and proportioning pumps and force-feed lubricators in Maine, Vermont, New Hampshire, Massachusetts, Rhode Island and Connecticut.

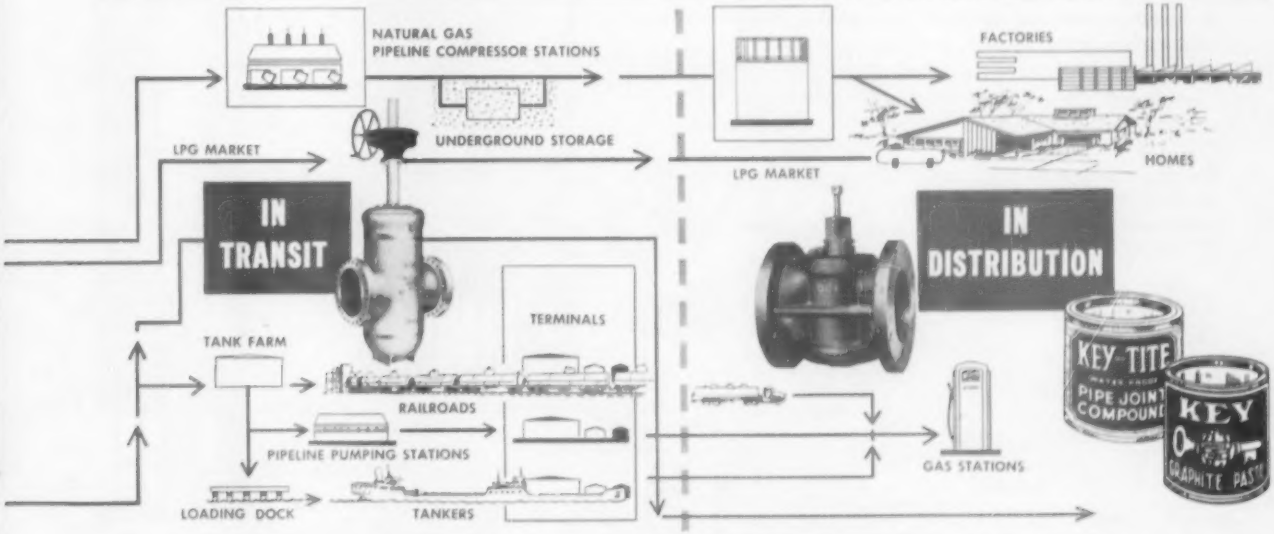
Hills-McCanna has appointed McRae Engineering, Ltd., Toronto, Canada, as exclusive representative for chemical metering and proportioning pumps and force-feed lubricators in Ontario and Quebec, Canada.

GE Makes Field Sales Appointments

V. E. Stineman has been named district manager at Los Angeles, Calif., for General Electric Co.'s communication products department. His appointment was announced by I. M. Ellis, regional manager for the department at Redwood City. He succeeds Kent Worthen, who has joined the communication products headquarters staff at Syracuse, N. Y.

John F. Conley, formerly GE district sales manager for communication equipment at Syracuse, becomes district representative for a new office in Miami, according to Fred W. Hall, Florida district manager, who has offices at Jacksonville.

Howell Ray Epps is communication engineer at Dallas supervising installation and maintenance of mobile radios in vehicles and offices. His duties include training and guidance of inde-



acf valves on the service lines in these plants, handle a wide range of commodities.

KEY Return Bends in furnaces and heaters. KEY-KAST Welding Fittings throughout the entire piping system where tees, wyes, ells, laterals, and other shapes are required.

IN TRANSIT—W-K-M pipeline valves all along the lines; in compressor and pumping stations; on loading docks, tank farms and terminal storage.

IN DISTRIBUTION—acf valves in gas storage and distribution systems for homes and industry.

KEY-TITE and KEY GRAPHITE PASTE for sealing threads and gaskets on lines handling water, steam, natural and artificial gas, oil, acid and refined petroleum products.

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DIVISION OF acf INDUSTRIES INCORPORATED
PLANT: MISSOURI CITY, TEXAS MAILING ADDRESS: P. O. BOX 2117, HOUSTON, TEXAS

MANUFACTURERS OF

W-K-M THROUGH-CONDUIT GATE VALVES

acf LUBRICATED PLUG VALVES

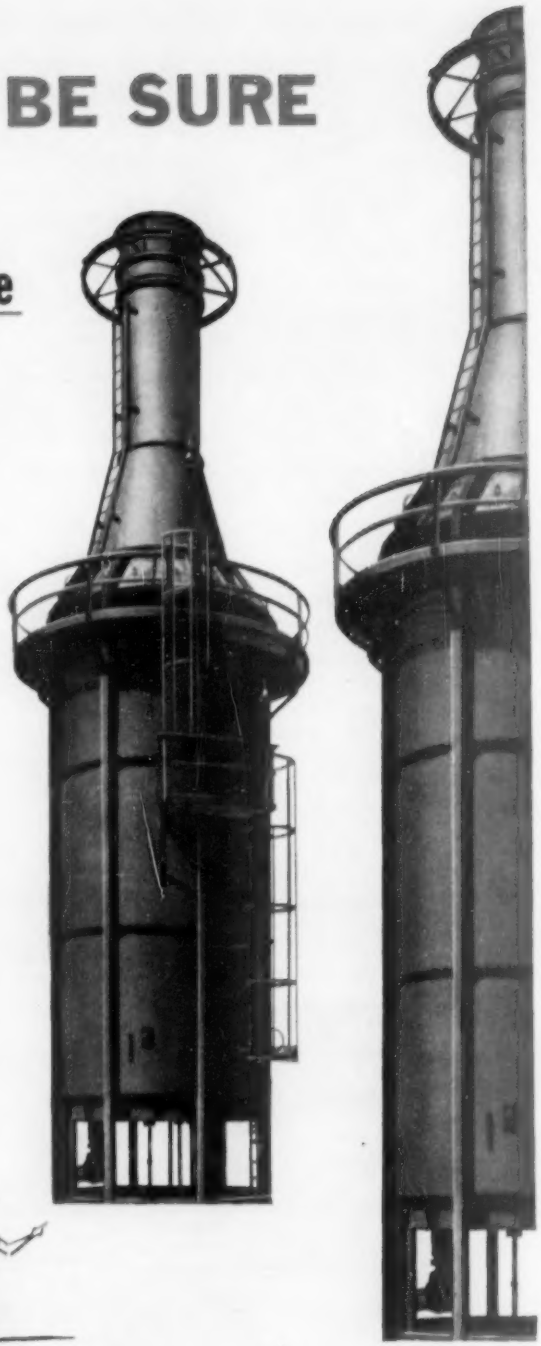
KEY RETURN BENDS AND FITTINGS

YOU, too, CAN BE SURE

petrochem-isoflow furnaces

are most economically desirable

by any comparison



Whenever *all* the specifications and *all* the operating requirements are applied to direct-fired furnace design, you can be sure PETROCHEM-ISOFLOW FURNACES will be found most economically desirable, by any comparison.

In making comparisons it is essential to take these factors into consideration:

1—Average radiant transfer rate.
2—Maximum deviation from average radiant transfer rate.
3—Average and maximum transfer rate in convection section.
4—Maximum tube wall temperature, radiant or convection.
5—Maximum efficiency with specified excess air.
6—Controlled thermal recirculation of flue gases to provide even heat distribution throughout full length of each tube and equalized heat distribution around each tube.
7—Overload and corresponding transfer load.
8—Design to provide: structural column supports—Ladders—Platforms—Tube Removal facilities, etc.
9—Degree of assembly; of the furnace structure and of the heating surface.

When you specify PETROCHEM-ISOFLOW FURNACES... you'll be in good company. More than 1500 are now in service, performing to the complete satisfaction of their operators and usually well beyond their rated capacities.

PETROCHEM-ISOFLOW FURNACES

UNLIMITED IN SIZE ... CAPACITY ... DUTY

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pendent service station technicians who maintain General Electric products.

Conley and Stineman will handle the sale of GE communication equipment.

Licensing Agreement Made Between Blaw-Knox and SBA

The petrochemical industry now has an opportunity to produce acetylene more efficiently through a licensing agreement consummated between Blaw-Knox Co., chemical plants division, Pittsburgh, Pa., and Societe Belge de l'Azote (SBA) of Liege. Belgium.

According to Blaw-Knox, the new SBA process offers better results in the manufacture of acetylene from natural gas. Heart of the system is the SBA burner with a patented design that limits the formation and deposit of soot, which causes frequent shutdowns of the unit. Thus, operating costs are lower and maintenance minimized.

Additional economies are realized in the acetylene purification step of the process, which uses ammonia rather than more expensive solvents common to other processes. This feature also eliminates the difficulties usually encountered with diacetylene polymers and produces a cleaner product.

Wicker Joins Tube Turns Sales Development Staff

Arthur Craig Wicker has joined the staff of the sales development department of Tube Turns, Louisville, Ky. The announcement was made by John G. Seiler, president of Tube Turns, a division of National Cylinder Gas Co., Chicago.

Wicker served with Girdler Co.'s Votator division and U. S. Plywood Corp. prior to joining Tube Turns. As a member of the sales development department he will specialize in new applications for Tube Turn products in the chemical industry.

Brown Oil Tool Adds to Sales Staff, Transfers Two

Fred Procter and Joel Little have joined the sales staff of Brown Oil Tool Co. Procter is located at Corpus Christi and Little at Brown's Oklahoma City store. Both Procter and Little have had considerable oil-field experience and have completed a training program at Brown Oil Tool's Houston plant.

Recent personnel changes involved transfer of R. C. Buchahan from New Orleans to Houston as city salesman and Paul Lawrence to New Orleans. Lawrence formerly was stationed in Corpus Christi.

Treco Appoints Park as Assistant Chief Engineer

Harold R. Park has been named assistant chief engineer for The Refinery Engineering Co., Tulsa. T. M. Lumly, Treco president, said Park will exercise control over the mechanical division, which currently is engaged in the design and construction of major projects at several points in the United States and Canada. One of them is a $10-million expansion and improvement job at D-X Sunray refineries in West Tulsa and Duncan, Okla.

Park served 31 years with Cities Service Oil Co., the last 7 as chief of the refinery engineering department.

Girdler Promotes Boyd

Paul B. Boyd has been promoted to the technical sales staff of the catalyst department of The Girdler Co., Louisville, Ky. The announcement was made by Dr. R. E. Reitmeier, manager of the department. Girdler is a division of National Cylinder Gas Co., Chicago.

Boyd joined Girdler in 1944 as an analytical chemist. From 1951 to 1954 he was in charge of the analytical laboratories engaging in catalytic research and development. He then was promoted to the technical service group,

2
GREAT NAMES ARE JOINED!

SEE PAGES 266, 267

SMOOTH RIDES IN THE ROUGH

Double-pivot shaft in tandem keeps load in balance in rough areas, guarantees load equalization between axles, reduces wear on tires.

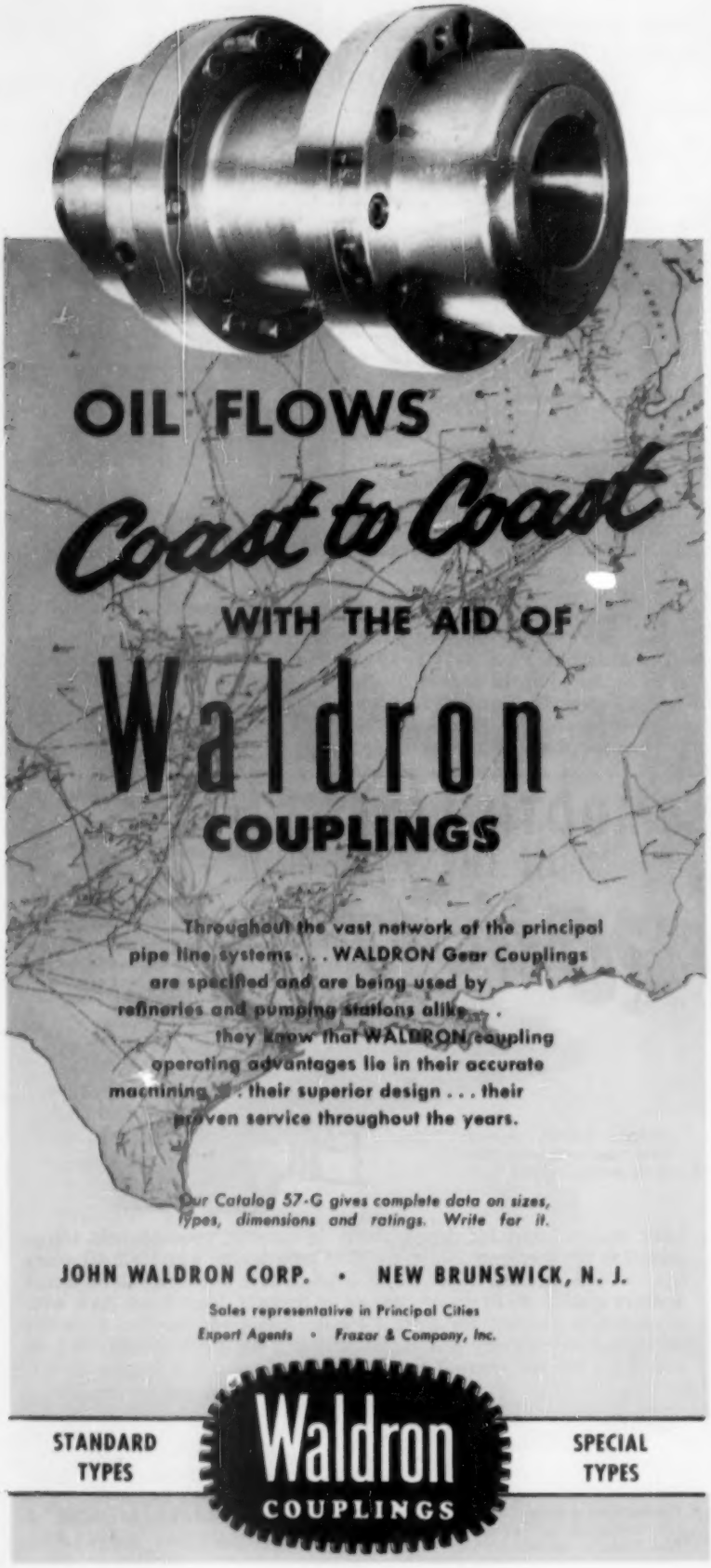
Exclusive hi-tensile, pressed-steel frame with angle truss brace permits heavier loads.

Look to Loadcraft for dependability in meeting your oil field transportation requirements. Since the first pole trailer was built 40 years ago by Fred Spencer, trailer manufacturers have attempted to duplicate Spencer quality. Pulls easier because of Spencer True-Beam Axle with machined-in camber, for correct toe-in, maximum tire life. Optional rolling tail pipe for rear loading has self-aligning roller bearings in each end. Find out for yourself that a Spencer Trailer is a quality trailer.

WRITE FOR LITERATURE

Choose from a complete line of Pole and Pipeline Trailers, as well as tandem or single-axle, semi-floats, or low-beds.

Spencer-Safford LOADCRAFT
AUGUSTA, KANSAS


OIL FLOWS
Coast to Coast
WITH THE AID OF
Waldron
COUPLINGS
Throughout the vast network of the principal pipe line systems . . . WALDRON Gear Couplings are specified and are being used by refineries and pumping stations alike . . . they know that WALDRON coupling operating advantages lie in their accurate machining . . . their superior design . . . their proven service throughout the years.
Our Catalog 57-G gives complete data on sizes, types, dimensions and ratings. Write for it.
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Sales representative in Principal Cities
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STANDARD TYPES
Waldron COUPLINGS
SPECIAL TYPES

which is responsible for field service and assists in improving industrial processes that employ catalysts.

Broderick Named Houston Manager by Swartwout

R. L. BRODERICK

Appointment of R. L. Broderick as Houston district manager for the Autronic process controls division is announced by The Swartwout Co., Cleveland, Ohio. J. B. Downey will continue as regional product manager for the Southwest. The Swartwout headquarters for the southwestern district are in the M & M Building, Houston.

Broderick has been in Swartwout's Cleveland plant for several years, most recently as project engineer of the Autronic process controls division, and previously as application engineer in the power-plant division.

Consolidated Acquires Assets of Castell & Co.

Directors of Consolidated Electrodynamics Corp. have approved purchase of the major assets of R. A. Castell & Co., Glendale, Calif., electronic components manufacturer, it has been announced by Philip S. Fogg, Consolidated board chairman.

Formed in 1949, the components firm has specialized in electronic subassembly work as a subcontractor in the missile field and in the development of miniature electrical connectors suitable for high-voltage operation at great altitudes and under adverse environmental conditions. Consolidated plans to broaden activities in these areas when Castell & Co. commences operations as the Glendale Division of Consolidated Electrodynamics Corp. R. A. Castell will serve as general manager of the division.

Mission Promotes Two To District Managers

John H. Brown has been promoted to manager of the Mid-Continent district of Mission Manufacturing Co. Included in this district are South Oklahoma, North Oklahoma, Kansas, and Northeast U. S. A. territories. John H. Bannister has been named manager for the West Texas district which includes New Mexico, Arizona, North Texas, West Texas and Northwest Texas territories.

These represent the second and third

Feet that move at your command

anywhere . . . anytime
trained specialists of the TOTCO service organization will answer your call for assistance in the field. They are just as reliable as the famed TOTCO recorders which give the ultimate in trouble-free service.

TOTCO

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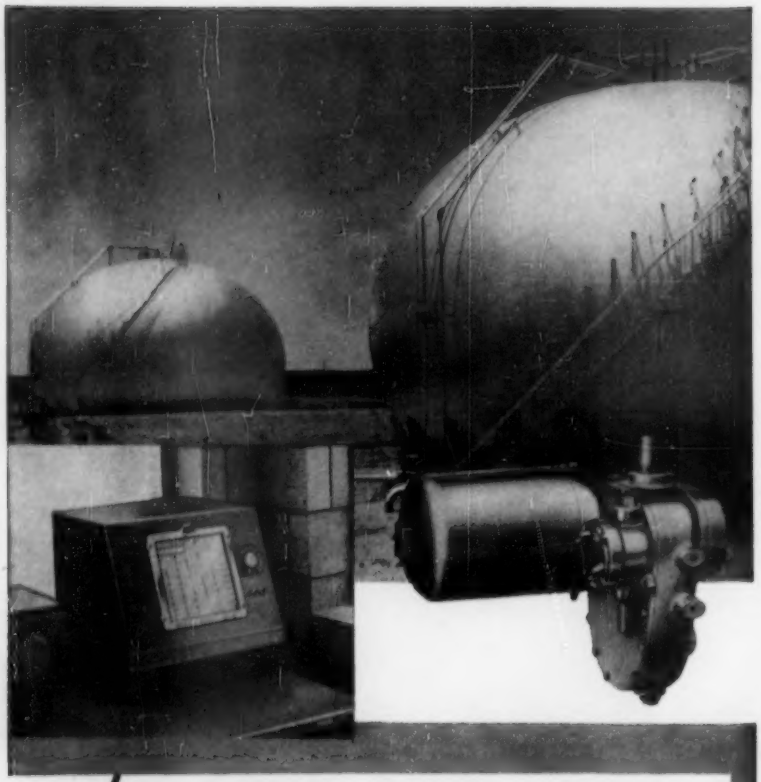
Exclusive Distributors: *California*—The Republic Supply Co. of California; *Domestic*—The Continental Supply Company; *Canada*—Oil Well Supply Company; *Export*—Lucey Export Corp., New York City



"Varec" PULSE CODE KEEPS "TAB" ON OKAN PIPELINE

Keeping a pipeline flowing smoothly is a mighty big job . . . that's why OKAN PIPELINE wants the latest in automatic equipment to speed its work. An important part of this equipment is the "Varec" PULSE CODE Telemetering System, which signals the liquid level of storage tanks at terminals and along the line. In addition to this function, it turns valves on and off by remote control.

"Varec" PULSE CODE operates over long distances, giving an accurate signal. It requires only a simple metallic pair for a communication link. It supplies a fast reading in the record time of 5 seconds. There is also a unique feature for remote control of valves, pumps, etc., which confirms that the proper selection of remote function has been made and indicates the status of the selected function. The operator may now change the status and receive a confirmation that it has been completed.

You may want to cut your operating costs by using a "Varec" PULSE CODE System. Equipment for reporting either spot or average temperature, in addition to liquid level, is now available.

Write for "Varec" Bulletin CP-3011 for full details on "Varec" PULSE CODE Telemetering.

961-17

THE VAPOR RECOVERY SYSTEMS COMPANY

"Varec"

Compton, California, U. S. A.

Cable Address: Varec Compton Calif (U.S.A.) All Codes

districts to be set up under Mission's expansion program.

Bannister has been headquartered in Midland, Tex., and Brown in Marlow, Okla.

Girdler Names Habermehl To Technical Service Staff

Robert Habermehl has been appointed to the technical service staff of the catalyst department of The Girdler Co., Louisville, Ky. The announcement was made by Dr. R. E. Reitmeier, who heads the department. Girdler is a division of National Cylinder Gas Co., Chicago.

Upon joining Girdler in 1950, Habermehl was engaged in developing and evaluating the performance of catalysts. Later he became the supervisor of a research group.

In his new capacity, Habermehl will assist industrial clients in making design recommendations where processes employ Girdler catalysts, and provide field services.

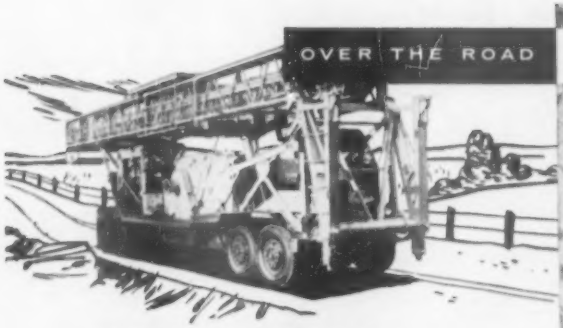
Petroleum Supply Appoints Lankford

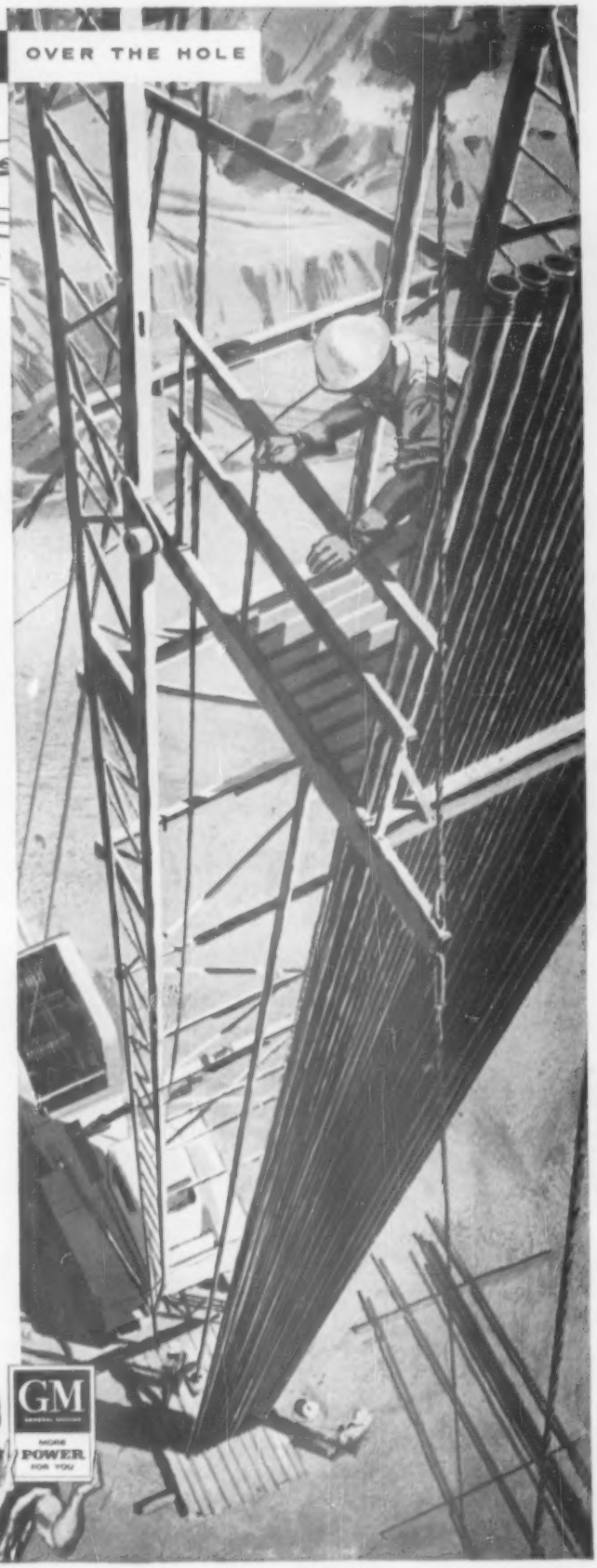
The appointment of R. L. Lankford as manager of engineering and production has been announced by Petroleum Supply Co., Houston. Prior to this, Lankford was with the industrial engineering department of Hughes Tool Co.

DeZurik Shower Co. Announces Name Change

Coinciding with the observance in 1957 of its twenty-fifth business year, DeZurik Shower Co. is placing into operation several substantial new additions to its plant at Sartell, Minn. At the same time, the company announced a change in its corporate name to DeZurik Corp.

The consistent increase in the company's nonlubricated plug-valve business has necessitated repeated additions to the plant. The photo was taken after completion of the most recent expansions. The dotted line in the lower left shows the original area of the plant. The area inside the solid lines shows expansions 15 and 16, completed in 1956. Expansion 15 doubled the production of castings from iron, Ni Resist metal and bronze foundries. Expansion 16 doubled facilities for machining, assembly and testing. Office and engineering facilities were also substantially increased.





TORQMATIC DOES DUAL DUTY

In Ideco's Drive-In Rambler Rig

Big money savers in the oil fields are self-propelled rigs like Ideco's Drive-In Rambler. It's a self-contained unit that can move into a location and start servicing or drilling in record time.

Big feature of the Drive-In is its Allison TORQMATIC DRIVE—the converter-transmission team that does dual duty in this rig. It powers the hoist *and* propels the Drive-In over the road.

On the highway, the Drive-In hits top speeds of 35 miles an hour, takes the steepest hills or roughest going in stride. The driver is freed from clutch-pedal pushing or gearshift guesswork because the TORQMATIC DRIVE matches engine power to load and grade demands, makes any greenhorn a slick operator.

Over the hole, shock-free power transmitted by the TORQMATIC DRIVE gives the driller inch-by-inch control. And this matched converter-transmission team takes it easy on rods, tubing, drill pipe, chain and the entire power train because it cushions power transmission and absorbs damaging shock loads, too.

Allison TORQMATIC DRIVES make it possible to build these modern, self-propelled units – and they've sparked other advances in many different types of equipment. If you'd build or buy better drilling, fracturing or servicing units that will save you money on every well, specify Allison TORQMATIC DRIVES. For full details write Allison Division of General Motors, Box 894R, Indianapolis 6, Indiana.

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TORQMATIC DRIVES

In WORLD-WIDE oil exploration more miles of shot hole have been

economically drilled with HAWTHORNE "Blue Demon" Bits

than with any other all-formation bit!

Shot hole drillers around the world get more footage faster, at lower cost-per-profile, with "Blue Demon" Bits . . . in 90% of all formations drilled. That's why more and more "Blue Demons" are traveling daily, by land, sea and air, to destinations everywhere . . . helping exploration budgets go further . . . improving footage production at minimum bit cost.

Shipments are handled promptly and efficiently from Houston and New York. Write for complete details on necessary papers and import applications required. Inquiries are answered the same day they're received.

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. . . And Another Good One's Coming Up

by Frank J. Gardner

THE 10 stars on the map are the top discovery events of 1956.

A good year . . . It was a good year. Probably our best since 1951. It was a year of achievement, geologically. Several so-called "frontiers" were invaded and conquered, and some great new reserves of oil were found.

With the advent of Aneth field in February, the Paradox basin burst upon the oil industry as the best new source of oil since Williston; reserve estimates depend upon whom you're talking to, but the conservatives admit to a figure of 100 million barrels of new oil in Paradox, while the optimists will go as high as 300 million. The San Juan basin emerged as a major source of oil, after years of mediocre oil finds, with the discovery of Bisti field.

Among the frontiers, perhaps the most important was the Las Animas arch. As one discovery followed another in southeastern Colorado and western Kansas, this vast subsurface uplift at last began to give up its elusive reserves of oil and gas.

In the East Texas basin, geological history was written. Here, two important forward steps were made, as two piercement salt domes yielded oil for the first time. For years, the nest of domes in East Texas had been written off; only two had ever produced any oil, and those were minor finds. Nor do the two new strikes at Hainesville and Bethel domes appear to be prolific. But the important thing was the realization that geologists and geophysicists had not worked hard enough on these prospects. This realization set off a land play throughout East Texas, Louisiana, and Mississippi. Another frontier had fallen.

The Cambridge arch of northern Kansas and western Nebraska was back in the news, as new discoveries were made along its flanks in Decatur County, Kansas, and Red Willow County, Nebraska. Again, a lease play flamed, as oil finders, armed with this encouragement, tried a new approach to the geology of a regional uplift.

And continued success . . . Excellent success ratios, and some mighty big wells projected the Panhandle area to the front of the exploration news. Continued successes in these western reaches of the Anadarko basin made news every week of the year; and at year's end, a major discovery in Woodward County, Oklahoma, added an untold amount of acreage to the "Morrow Trend," which so far had reached an activity zenith in the Harper and Beaver counties area.

The top development story of the year was the growth of Citronelle. This southern Alabama field, a one-well project at the beginning of 1956, grew into a 100-million-barrel giant within 9 months. Still undefined, its full story is yet to unfold.

South Texans probed ever deeper into the Lower Cretaceous-Edwards limestone, and came up with a 50-mile trend of 10,000 to 12,000-ft. gas-condensate fields. The greatest of these was a 1956 strike in southeastern Atascosa County, where 580 ft. of good porosity was cored in discovery well.

Canada had a bumper year of discoveries and development. Most sensational event of 1956 was the land play set off by the discovery of Red Earth Creek field, far to the north of previous discoveries. In the Peace River district, success followed success as operators scored one producing well for every two they drilled.

Imply a new cycle . . . It was a good year. Another is coming up. This column predicts that the industry is now entering that long-awaited cycle of discovery; the last such cycle was in 1949. The next one is here. **End.**

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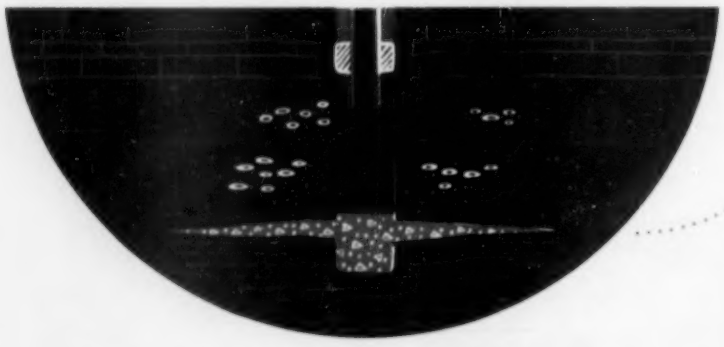

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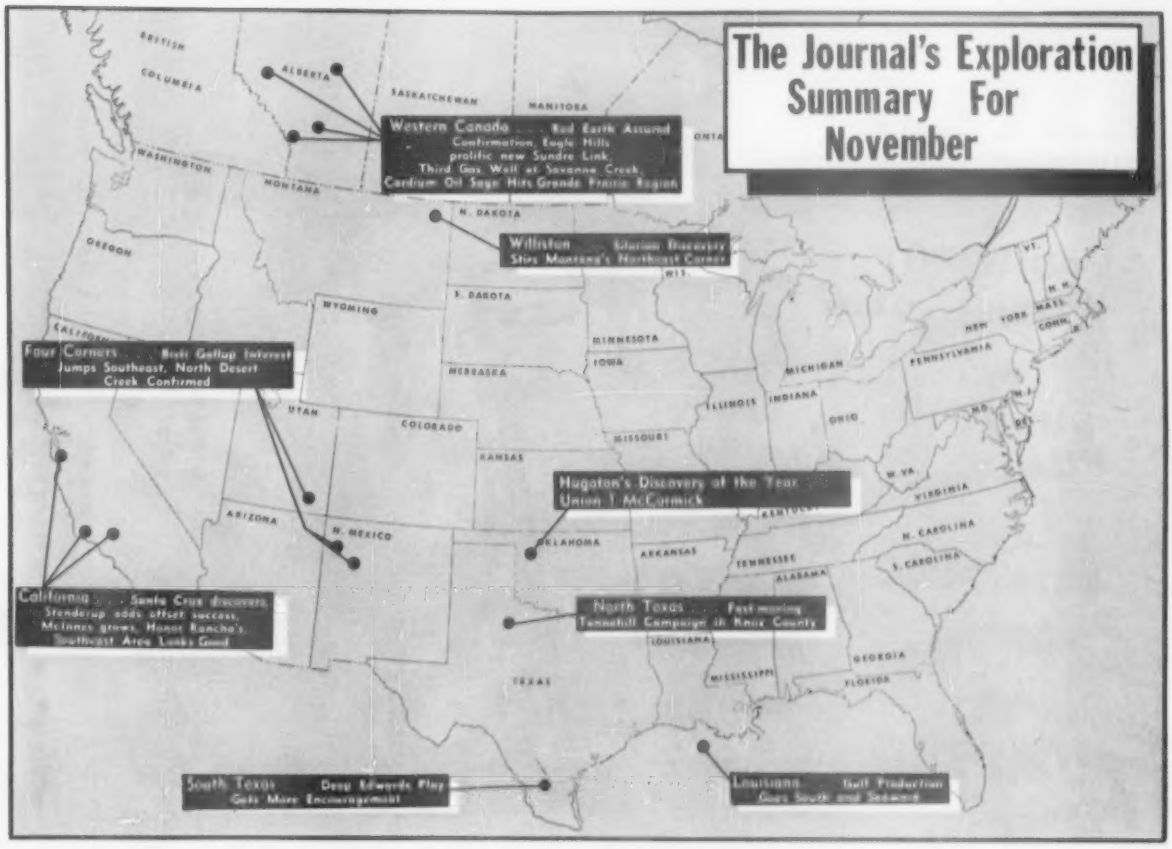

Northwestern Oklahoma comes to life as . . .

Hugoton's Morrow Fame Grows

by John C. McCaslin
District Editor

A MONTH of important extensions, discoveries, and confirmations throughout the country was capped by one of the most significant Morrow-Pennsylvanian sand discoveries in the Hugoton embayment to date.

Vast new Morrow area opens . . . Union Oil Co. of California uncovered a major strat trap in Woodward County, northwestern Oklahoma. The 1 McCormick flowed 25,000 M.c.f. of gas per day on 2-in. tubing on open-flow potential. Distillate flow was 15½ bbl. per million.

The Morrow sand discovery opens first production in Woodward County and is considered a major strike for the Hugoton embayment province. Location is 35 miles southeast of Morrow production in the booming Laverne district of Harper County. Union's big strike has opened a major lease play throughout Woodward, Dewey, Blaine, and Harper counties. Union may have uncorked a large regional trend of Morrow production. At any rate, a huge chunk of northwestern Oklahoma is now laid open to Morrow prospecting.

Louisiana moves south . . . Pelican offshore production moved to its southernmost point, more than 40 miles off the mainland.

Gulf's Block 176, Ship Shoal area wildcat, a joint venture with Humble Oil & Refining Co., flowed 1,780 M.c.f. of gas and some distillate from perforations at 6,820-26 ft. Location of the seaward 1-A OCS 0589 discovery is about 51 miles south of the Pointe Au Fer shoreline in 95 ft. of water. The well is about the same distance from land as California Co.'s field in Block 160, East Cameron area, and about 4 miles south of prolific Block 154 field where 25 wells are producing oil.

New Edwards fire . . . The deep Edwards trend in South Texas got further encouragement as a result of Lee Brothers Oil Co. 2 Storey in the White Kitchen area, 2 miles west of Washburn field in eastern LaSalle County.

The well produced gas from the Edwards at 10,407-30 ft., further strengthening the rapidly growing deep Edwards compaign building up in South Texas.

Sundre trend grows . . . Another prolific addition to the Sundre-Westward Ho area in southwestern Alberta was made by Hudson's Bay Oil & Gas Co.,

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Total November Completions, Exploration and Development

	Total completions					Total wildcat wells					tool comp.	operations
	Total	Oil	Gas	Dry	Footage	Total	Oil	Gas	Dry	Footage		
Alabama	7	3	0	4	58,677	3	0	0	3	12,827	2	18
Arkansas	100	74	1	25	283,517	11	3	0	8	45,281	10	104
California	201	143	3	55	821,850	45	1	0	44	173,685	0	235
Colorado	101	17	10	74	483,237	62	1	3	58	279,821	0	79
Florida	1	0	0	1	11,800	1	0	0	1	11,800	0	2
Illinois	295	117	5	173	628,760	71	5	1	65	134,039	82	452
Indiana	84	30	1	53	135,162	14	1	0	13	19,722	60	102
Kansas	364	159	19	186	1,305,190	80	8	5	67	318,045	31	411
Kentucky	175	73	12	90	241,412	33	3	0	30	41,650	158	255
West	157	73	0	84	186,169	31	3	0	28	35,110	140	190
East	18	0	12	6	55,243	2	0	0	2	6,540	18	65
Louisiana	298	157	28	113	2,257,983	59	12	4	43	581,260	0	481
North	129	74	11	44	486,866	22	4	0	18	143,833	0	168
South	125	64	8	53	1,311,025	33	7	3	23	383,351	0	240
Offshore	44	19	9	16	460,092	4	1	1	2	54,076	0	73
Michigan	24	13	1	10	73,233	6	0	0	6	21,654	20	127
Mississippi	29	7	0	22	197,084	18	2	0	16	127,100	0	46
Montana	41	14	0	27	198,721	20	0	0	20	80,665	11	65
Nebraska	50	20	0	30	292,034	25	4	0	21	142,106	0	40
West	48	19	0	29	285,640	24	4	0	20	138,807	0	37
East	2	1	0	1	6,394	1	0	0	1	3,299	0	3
New Mexico	171	80	51	40	776,554	30	6	0	24	199,729	7	179
Northwest	75	12	47	16	280,696	15	2	0	13	60,872	0	73
Southeast	96	68	4	24	495,858	15	4	0	11	138,857	7	106
New York	50	23	1	26	66,000	0	0	0	0	0	50	24
North Dakota	23	12	0	11	147,862	9	0	0	9	48,502	0	37
Ohio	92	44	22	26	225,725	0	0	0	0	0	90	135
Oklahoma	577	334	21	222	1,935,362	57	9	0	48	247,495	98	829
Pennsylvania	14	0	14	0	43,384	1	0	1	0	7,585	7	52
Texas	1,738	1,043	73	622	7,650,381	439	44	19	376	2,119,199	83	1,345
Southwest (1)	95	48	1	46	282,332	43	4	0	39	132,326	4	76
Gulf (2)	63	20	15	28	353,988	23	0	4	19	124,013	0	44
Gulf (3)	171	82	22	67	1,190,976	50	1	10	39	407,385	0	161
Southwest (4)	120	50	11	59	634,130	41	1	3	37	227,892	0	94
East (5 & 6)	113	57	4	52	640,949	42	2	0	40	245,986	2	123
West Central (7-B)	226	129	2	95	814,936	65	4	1	60	279,300	18	148
West (7-C & 8)	476	386	3	87	2,363,795	62	14	0	48	388,829	32	455
North (9)	369	198	0	171	1,006,329	101	18	0	83	273,277	27	121
Panhandle (10)	105	73	15	17	362,946	12	0	1	11	40,191	0	123
Utah	26	10	2	14	129,787	19	5	1	13	93,067	0	32
West Virginia	55	4	43	8	154,640	1	0	1	0	1,850	50	211
Wyoming	88	40	9	39	324,420	28	2	1	25	104,205	13	129
Total November 1956	4,604	†2,417	316	*1,871	18,442,775	1,032	‡106	36	890	4,811,287	772	5,390
Total October 1956	5,079	2,611	446	2,022	20,008,078	1,182	157	59	966	5,606,809	887	5,364
Cumulative 1956	53,553	28,823	3,785	20,945	215,538,399	11,933	1,505	415	10,013	56,884,383	8,877	
Cumulative 1955	51,973	29,055	3,284	19,634	207,679,318	11,253	1,682	321	9,250	54,249,040		
Western Canada	292	196	21	75	1,336,998	79	12	9	58	365,995		
Alberta	143	95	14	34	763,870	38	4	8	26	214,842		
Saskatchewan	110	76	1	33	461,098	35	8	1	26	130,580		
Manitoba	30	24	0	6	65,816	4	0	0	4	10,941		
British Columbia	9	1	6	2	46,214	2	0	0	2	9,632		
Alberta 1956	1,707	1,264	124	319	9,182,808	334	54	50	230	1,940,912		
Saskatchewan 1956	988	703	10	275	4,120,132	275	66	1	208	1,176,407		
Manitoba 1956	226	176	0	50	524,108	39	3	0	36	119,091		
British Columbia 1956	52	4	34	14	301,981	24	0	10	14	158,454		
Canada 1956	2,973	2,147	168	658	14,129,029	672	123	61	488	3,394,864		

*Incl. 91 service wells: Calif. 2, Ind. 2, Kans. 6, N. Y. 23, Ohio 11, Okla. 46, Tex. (4) 1. †Incl. 18 dist. wells: S. La. 3, Okla. 13, E. Tex 2. ‡Incl. 4 dist. disc.: N. La. 1, S. La. 1, E. Tex. 1, Okla. 1.

Ltd. The 1 Eagle Hill flowed oil from the Mississippian at the rate of 732 bbl. per day. Location is 2 miles north of Westward Ho field and 3 miles east of the south end of Sundre field.

Red Earth confirmed . . . The discovery well that fired the largest single land play in the history of western Canada's oil industry earlier this year seems assured of confirmation.

Union Oil Co.'s 12-16 Red Earth Creek, initial followup to the Granite Wash oil discovery 75 miles northeast of Peace River and 200 miles northwest of Edmonton, recovered 4,570 ft. of very gassy light oil on drill-stem test. Location is 1 mile east of the famed discovery well.

[illegible]n's drilling project is being carri[illegible] Petroleum and Natural Gas Re[illegible]ation No. 2349, and as well as the two strikes to date on that tract, the company has drilled one dry hole (5 miles north), is now drilling another test (3 miles east), and has staked location for an immediate try at another (1 mile north and ¼ mile east of the confirmation).

This reservation covers a total of 99,840 acres and is part of 1½ million acres held in the "Granite Wash" play area by the company.

New Cardium surprise . . . Bailey Selburn has what appears to be a commercial Cardium sand oil discovery at East Cutbank in northwestern Alberta's Grande Prairie region. Five previous wildcats in this virgin wildcat country had Cardium oil shows, but this one appears to have the best prospects. Success at East Cutbank would move Cardium production to its northwesternmost spot in Alberta.

Bisti jumps southeast . . . Forest Oil Corp. moved the Gallup sand trend in

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the San Juan basin 16 miles southeast of Bisti field at 1 Federal. The well pumped 120 bbl. of oil per day from highly regarded new oil pay in the San Juan basin.

Anderson-Prichard Oil Corp. 1 Heirs of Ko-Sa, 3 miles east of Carson area Gallup production in the Bisti region, flowed oil at the rate of 25-35 bbl. hourly on tests, putting further heat on the Gallup campaign in San Juan County, New Mexico.

Paradox confirmation . . . The confirmation well and northeast offset to North Desert Creek in San Juan County, Utah, flowed oil at the rate of 1,402 bbl. per day from the Paradox-Penn.

West Coast encouraged . . . California oil hunters are making real exploratory headlines this year. November happenings out west included a new oil field in the rugged Santa Cruz basin south of San Francisco, new additions to Honor Rancho pool's new southeast area, more big wells at Texaco's promising McInnes pool in Ventura County, and completion of the first offset well at Union's Stenderup discovery in the Arvin area of Mountain View field, Kern County.

Montana Williston awakens . . . Amerada apparently moved Montana Williston production to its northernmost point at 1 Tange, opening first production for Sheridan County, and reviving interest in the Silurian potentialities of the basin.

North Texas . . . Southern Knox County in the Baylor basin has come into prominence in recent months because of a sudden drilling spree in the Tannehill sand. A goodly number of small operators plus a couple of majors found some good-looking 80-160-acre oil prospects, drilled them up fast, and uncovered one of the liveliest drilling campaigns in North Texas in years.

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EXPLORATION HIGHLIGHTS

MID-CONTINENT

KANSAS

Mississippian Strike In Southern Sedgwick

A new pool or extension to Brumley pool in southern Sedgwick County is indicated at L. B. Newman & Bros., 2 Roy, SE SE SW 33-21s-14w, ¾ mile west of Brumley pool and 2½ miles west of Waco Wego. This well flowed 100 bbl. of oil per day on 13/32-in. choke after fracture from open hole in the Mississippian at 3,351-55 ft.

Tests Under Way at Hodgeman Prospect

Testing is under way at a new Mississippian oil discovery prospect in Hodgeman County. Earl Wakefield 1 McAdoo, NE NE NE 19-21s-24w, 8 miles northwest of Jetmore pool, tested the Mississippi at 4,462-75 ft., recovering 160 ft. of free oil, 90 ft. of

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SEE PAGES 266, 267

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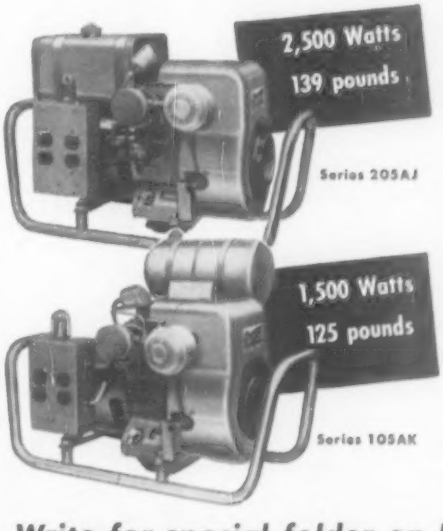

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oil-cut mud. Another test at 4,475-4,505 ft. got 255 ft. muddy water and 120 ft. of water with oil trace.

Viola Discovery Flows Oil in Barber County

A Barber County wildcat flowed oil on drill-stem test in the Viola lime at 4,557-71 ft. The discovery is Aylward Drilling Co. 1 Walker, 1 mile northwest of Sun City pool and 3½ miles northwest of the town of Sun City in northwestern Barber County.

Kiowa County . . . In southeastern Kiowa County Aurora Gasoline Co. 1 Miller, NW NW SE 19-29s-16w, 3 miles southwest of Pyle pool and 4 miles northwest of the town of Belvidere, tested oil and gas in the Mississippian topped at 4,701 ft. Drill-stem test at 4,703-15 ft. gaged 139 M.c.f. of gas and recovery was 180 ft. muddy oil, 720 ft. free oil.

NORTHWEST KANSAS

Decatur County Adds New Producing Prospect

Cities Service Oil Co. apparently has another discovery in northern Decatur County on the flanks of the Cambridge arch. The 1 Cathcart, SE SW SE 17-1s-27w, 12 miles northeast of Oberlin, Kans., tested the Lansing at 3,412-28 ft., recovering 30 ft. gas and 32 ft. muddy oil. Another test at 3,441-55 ft. got 30 ft. mud. This new strike is 3 miles southwest of Warner pool, one of Kansas' most significant strikes of 1956.

OKLAHOMA

Offsets Successful At North Payne

First Bromide sand pay has been proved at two offsets in McClain County's North Payne pool. The new strikes are Weimer and Fitzhugh 1 Hanley Unit, NE SE NW 5-5n-3w, and 1 Pugh, C N½ NW SE 5-5n-3w. The first well recovered 1,170 ft. of oil and 270 ft. oil-cut mud on a test at 10,180-10,213 ft. The second got 300 ft. of oil on test at 10,142-72 ft.

Two Wells Added to Northeast Moore Field

Two wells were added to Northeast Moore field, Cleveland County, by Lone Star Producing Co. The 1 Turner-A, C NE NE 14-10n-3w, flowed 4 bbl. of oil per hour on 14/64-in. choke from perforations in the Bartlesville sand at 7,342-92 ft.; the Hunton flowed 3 bbl. per hour on ⅛-in. choke at 7,455-7,501 ft.

The 1 Nail, C SE NW 14, flowed 285 bbl. of oil in 32 hours on ¼-in. choke from the Hunton after acid through perforations at 7,528-53 ft.; the Bartlesville was good for 68 bbl. in 8 hours on 20/64-in. choke at 7,447-59 ft.

New Pay Tested at Blue Hill Well

The Hart sand is a new oil pay for McClain County's Blue Hill field. J. Ray McDermott 1 Weeden, C NW NW 31-8n-3w, flowed 60 bbl. of oil per day on 22/64-in. choke from perforations at 8,870-80 and 8,886-8,900 ft.

Another Deep Well Added to Bradley Area

Ohio Oil Co. added another deep producer to Southwest Bradley field in Grady County at 1 Lodge Unit, C NE SE 4-4n-5w.

The well flowed 431 bbl. of oil per day from upper Simpson - Ordovician perforations at 13,707-13,888 ft. on 14/64-in. choke plus 1,300 M.c.f. of gas per day. From lower Simpson the

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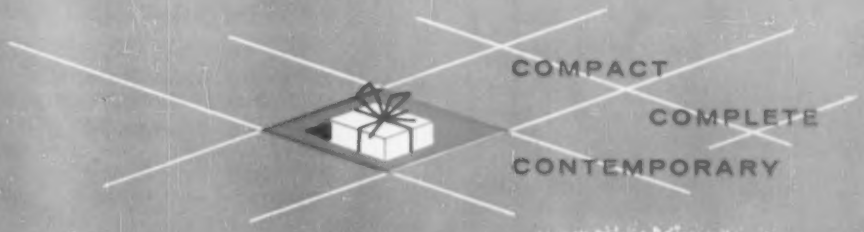

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well made 155 bbl. of oil in 23 hours at 14,034-14,179 ft. on ½-in. choke.

Oil Discovery Reported At Gas Strike Offset

Oil production was uncovered at the first offset try to a recent gas discovery in Grant County, northern Oklahoma. The oil strike is Viersen & Cochran 1 Stoll, C SW SW 20-28n-5w. It flowed 18 bbl. in 6 hours on 18/64-in. choke from perforations at 4,697-4,729 ft.

North Clyde . . . Atlantic Refining Co. 1 Dahlem, C NE NE 28-28n-6w, flowed 3,060 M.c.f. of gas per day on completion through 20/64-in. choke from Cherokee sand-Pennsylvanian perforations at 4,771-84 ft.

Sinclair Will Test More Pay at Dewey

Sinclair Oil & Gas Co. will plug back and perforate more zone at its 1 Kunc, indicated Oswego-Pennsylvanian discovery southwest of the town of Taloga in Dewey County, northwestern Oklahoma.

The discovery flowed 103 bbl. of oil per day on 1-in. choke from perforations at 9,159-93 and 9,201-13 ft. Gas flow was 3,000 M.c.f. of gas per day.

Third Well Added To West Dale Field

West Dale field, a small Pottawatomie County Wilcox producer, added its third oil well. Warren Petroleum Corp. 1 Rooker, SE SW NE 27-11n-2e, flowed oil at the estimated rate of 25 bbl. hourly on drill-stem test of the Wilcox sand at 5,850-58 ft.

Second Well Added to West Wilson Field

Carter County's West Wilson field got its second Frankfort Oil Co. well, the 1 Sturm, C SW SW 1-5s-3w. The well flowed oil at the rate of 10 bbl. per hour from the Hunton lime. Sylvan shale was found at 6,296 ft.; Chimney Hill at 6,818 ft. The test was made at 6,825-70 ft.

East Norfolk Field Expanded in Payne

A new Prue sand oil well was added to Payne County's East Norfolk field. Flynn Oil Co. 2 Jardot, NW SW SE 32-19n-6e, flowed 21 bbl. of new oil per hour on 21/64-in. choke from perforations at 2,945-71 ft.

Apache Adds Second Oil Well at Stillwater

Apache Oil Co. 1 McGinnis, C NW SW 23-19n-2e, Stillwater townsite, Payne County, is the second producer in the area. The well swabbed to flow 56 bbl. of oil in 14 hours from perforations at 4,054-60 ft. and 4,043-49 ft.

Osage County Well Flows Simpson Oil

Cities Service Oil Co. 1 Kennedy-C, NE NE NW 9-25n-7e, Osage County, flowed 88 bbl. of oil per day from Simpson sand perforations at 2,980-3,004 ft. on ¼-in. choke. This well is in the new Strohm field.

Beaver Pool Well Completed in Stephens

Stephens County's Beaver field has a good Coline sand well at Slats Honeymon Drilling Co. 1 Nash, SE NE SW 4-2n-8w. The well flowed 302 bbl. of new oil in 11 hours on 25/64-in. choke from perforations at 6,621-40 ft. Nat-

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THOMPSON
SAND RESISTANCE
OIL WELL PUMPS

TRAVELING PLUNGER ROD TYPE BOTTOM HOLD-DOWN PUMP STANDARD SIZE

Figs. 400P, 600P, 700P, 800P

Single or double, self-aligning, combination cup and plunger or all-metal traveling plunger type pumps made in four sizes: regular 1½", 1⅝" oversize, 2" regular and 2⅛" oversize bore. These pumps seat in API seating device. In very sandy wells, or when tubing is out, we recommend our SAND HOUSING MECHANICAL SEATING SHOE, which prevents sanding in of pumps as sand can be pumped and the pump pulled at any time by our sand flushing arrangement.

TOP HOLD DOWN INSERT ROD PUMP

Standard Size, Figs. 400T, 500T

Self-aligning double plunger insert pumps. Made in three types: combination cup and single plunger; combination cup and double self-aligning type; and metal-to-metal double plunger self-aligning type. All are equipped with Regular or Extra Long Alloy Plungers, ground individually to fit the barrels, assuring longer life on both pump and surface equipment.

SELF-ALIGNING SAND SEALED-OFF PUMPS

Figs. 600-800-900

Inverted Combination Single or Double Plunger Self-Aligning Pumps can be equipped with a Sand Flush Valve which seals the Plunger off on top and cleans the barrel every pump stroke.

Sand is deposited into blind cage above the plunger and is discharged every stroke of the pump. The bottom of plunger is sealed to eliminate slippage. Easy on surface equipment. Lower lifting cost with Sealed-Off Pumps.

Can be run in any API seating device or use an adapter to fit the seating device preferred. We carry in stock at all times Special Heavy Duty Sand Housing Mechanical Seating Shoes which are very important to bad sand conditions—a place for sand to settle, so when pump is on down stroke, the bottom barrel bushing with a double spiral spray reaches into the sand housing, moving the sand out into the tubing.

SPECIAL HEAVY DUTY SEATING DEVICE

This special Combination Sand Housing and Seating Device is invaluable in bad sand conditions, especially where pump is sanding into the tubing. In extremely sandy wells the pump may be unseated occasionally to allow a small portion of tubing fluid to flush through the sand housing and return the accumulated sand to the well.

Pumps for all fields, depths and conditions. For further information write for complete catalog.

NEW BALL HOUSING CAGE

The new sensational positive action cage with patented stationary ball housing guide that encloses the ball and allows fluid to by-pass the ball thus eliminating all fluid restriction; and also positively eliminates ball spinning and chatter, preventing ball from beating out the cage. There are no moving parts in the cage.

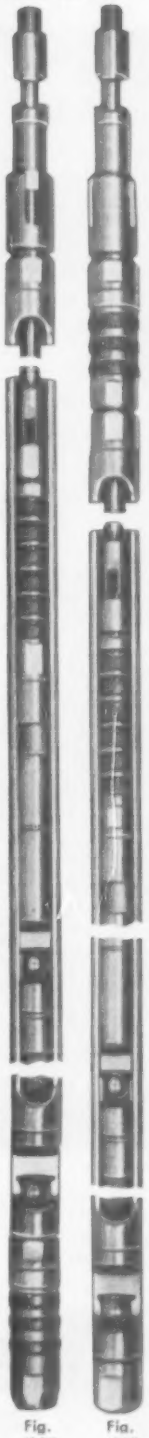

Fig. 400P 600P 700P 800P

Fig. 400T 500T

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OKMULGEE, OKLA.

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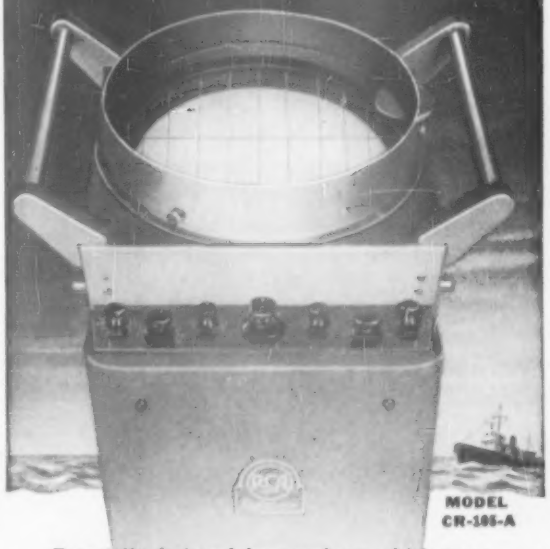
- Saves Space
- Saves Power



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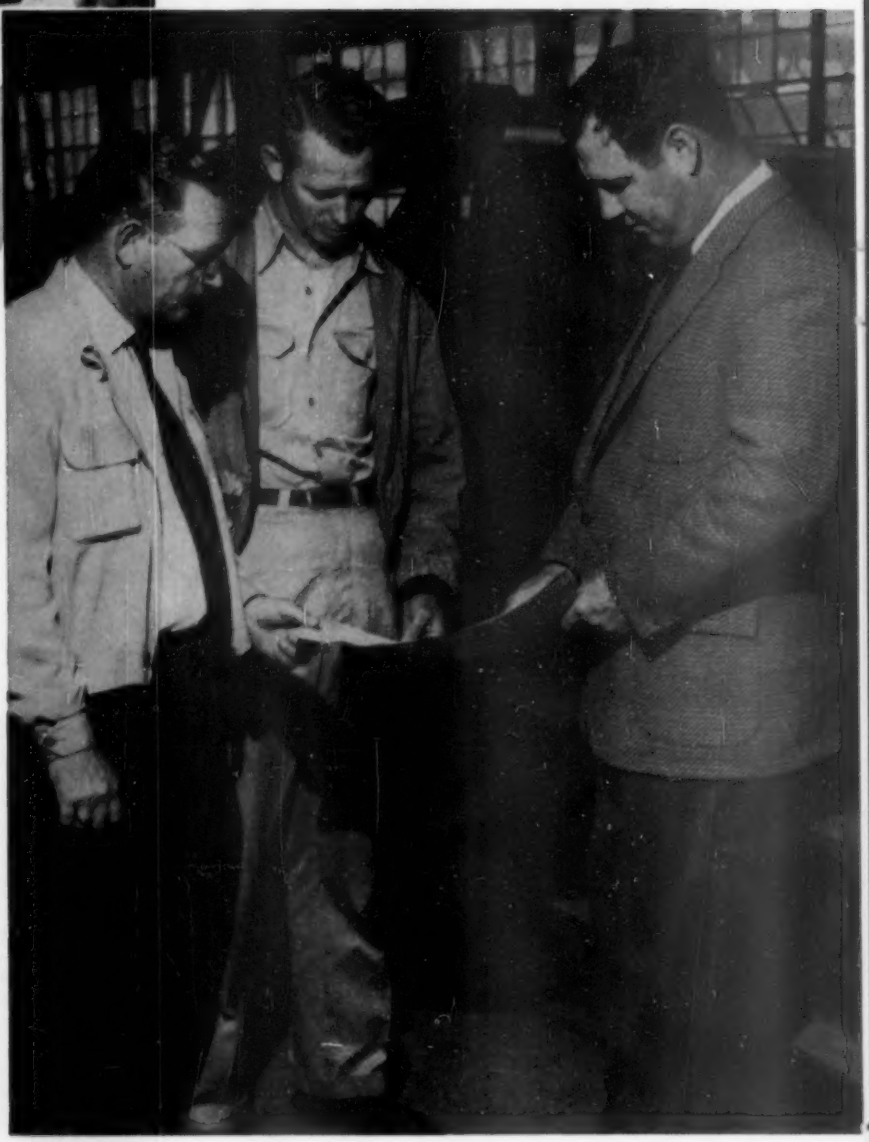

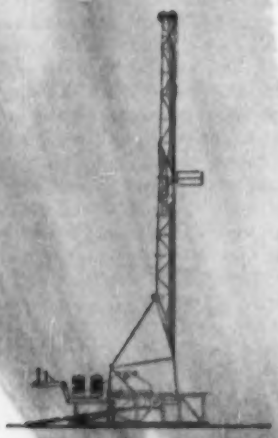

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urally, the well made 28 bbl. per day on 22/64-in. choke.

Ordovician Tested At Noble Well

The Tulip Creek and Bromide sands were tested at Anderson-Prichard Oil Corp. 1 Allison, Noble townsite wildcat in NE NE SW 27-8n-2w, Cleveland County. The well flowed 199 bbl. of oil in 14 hours on ¼-in. choke from perforations in the Tulip Creek sand; 300 bbl. in 19 hours on ¼-in. choke from the Bromide sand at 7,900-05 ft.

NORTH TEXAS

Jones County Gets Tannehill Discovery

Chalmers & Curry 1 Julis Moore, 3 miles east of Truby field, has been completed as a Tannehill sand discovery. Initial potential was 67 bbl. of 39° oil a day through ¼-in. choke, from open hole at 2,075-89 ft. Gas-oil ratio was 300:1. Location in T. Maltby Survey 252 is about 3 miles west of the town of Hawley, in the southeastern part of the county.

Locations for new wildcats in Jones County included a 3,000-ft. Palo Pinto test 6 miles east of Anson by Peter F. A. Bell, as the 1 Baucum. Drillsite is in Section 38, OAL Survey.

Texas Crude Oil Co. has made location for 1 R. C. Brown on a 125-acre lease in the Austin and Williams Survey 355, 1½ miles southeast of Hamlin. Projected depth is 3,700 ft.

WEST CENTRAL TEXAS

Depleted Discovery Opens New Pay on Workover

American Liberty Oil Co. 2 W. I. Shadle, in 134-D-H&TC, opener of Cambrian sand pay in Schick field, has been recompleted as a Strawn well. Schick field, 4 miles north of Aspermont, produces from the Bend conglomerate.

No. 2 Shadle made a new potential of 143 bbl. of 42° oil a day through 12/64-in. choke, from Strawn perforations at 5,403-07 ft. Gas-oil ratio was 480:1. Tubing pressure was 215 psi. Top of pay was 5,386 ft. on elevation of 1,699 ft. No. 2 Shadle was a Cambrian discovery in November 1955, flowing 264 bbl. daily from perforations at 6,106-13 ft.

Fisher County . . . Ada Oil Co. 2-B Sam Swann, development well in the Ada field, had prospects of a new and shallow pay zone for the field. A 2-hour drill-stem test in Noodle Creek lime at 2,622-48 ft. recovered gas, 120 ft. of oil-cut mud and 900 ft. of salt water. Operators swabbed some oil following the test.

The 2-B Swann was drilled ahead to the field's reef pay, and flowed oil on test at 4,418-70 ft. Location is in R. S. Spires Survey 283.

Taylor County . . . S. C. Herring Drilling Co. 1 Farr, Section 52, John L. Smith Survey, has completed as a Gardner sand discovery. Potential was 44 bbl. of 41° oil a day through 14/64-in. choke, from perforations at 4,326-34 ft. Location is 6 miles north of Buffalo Gap.

HUGOTON EMBAYMENT

OKLAHOMA PANHANDLE

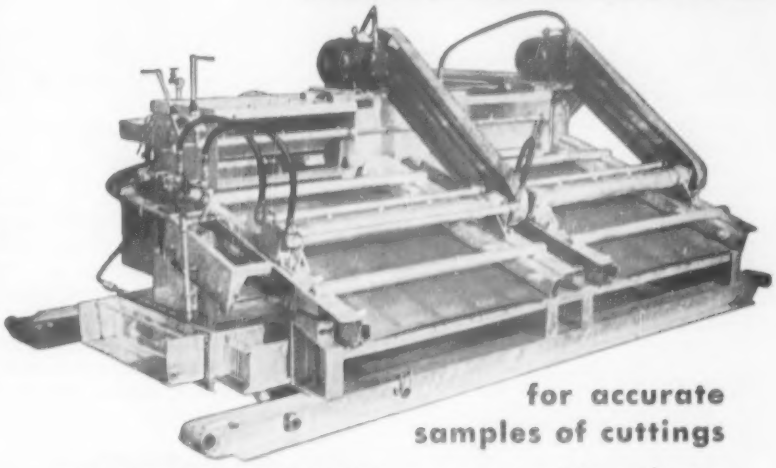
Third Try Due to Confirm Beaver Field

A third offset try will be drilled by Carter Oil Co. in an attempt to confirm the discovery well of Dower field, Beaver County.

The 1 Gray, SE SE NW 34-1n-21eCM, will test the Morrow and Chester to 8,300 ft. The discovery well at Dower, Sunray 1 Balmer, NE NE SW 28-1n-21eCM, flowed 15,500 M.c.f.

Thompson

DOUBLE VIBRATING SHALE SHAKER...and SAMPLE MACHINE



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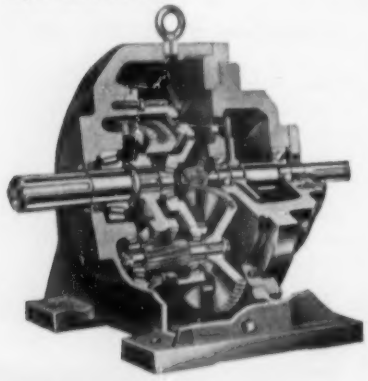
FLEXIBLE... ECONOMICAL... EFFICIENT

The streamlined compactness of these new units makes them ideal for mounting in places where space is limited. Accurately manufactured helical gearing, rugged housing construction and precision mounted shafts and bearings assure long, dependable service, with a minimum of maintenance. The *new* Phillie Gear "IN-LINE" Reducers are available in 18 different sizes and gear reductions to suit most types of service. Available for mounting in various positions . . . Standard AGMA ratios from 1.25:1 to 205:1. Send for illustrated Literature describing these money-saving Speed Reducers.



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of gas per day and 30 bbl. of distillate per million from treated Morrow sand perforations at 8,042-66 ft. One dry hole was put down in Section 32, another in Section 29.

OKLAHOMA PANHANDLE

Panhandle Completed Wilson Producer

Panhandle Eastern Pipe Line Co. announced completion of a prolific wildcat oil and gas discovery at 1 Wilson in 23-4-13eCM, Texas County, inside Hugoton field in the area known as Fox Block.

On November 30 the Wilson well flowed 3,500 bbl. of oil per day plus 5,000-6,000 M.c.f. of gas per day. Perforations were in the lower Morrow at 6,441 to 6,472 ft. The well flowed oil and gas immediately after perforation through 5½-in. tube. Early in November this well flowed gas in the Toronto at 4,202-76 ft. Gas was gaged at 3,250 M.c.f. per day on drill-stem test. Gas also was recovered at two other horizons in addition to the Toronto and Morrow.

NORTHWEST OKLAHOMA

Oil Flow From Tonkawa Reported in Harper

A Harper County wildcat, southeast of Southwest Stockholm gas field, flowed 133 bbl. of oil in 5½ hours on 1-in. and ½-in. chokes from perforations in the lower Tonkawa-Pennsylvanian at 5,490-92½ ft., natural.

On a 24/64-in. choke the well average 13 bbl. per hour for 3 hours. On 26/64-in. choke a 1-hour flow was 15½ bbl.

Laverne district . . . Sun Oil Co. has a two-zone gas well at 1 McClung, C SW NE 24-26n-25w, Harper County. The well flowed 1,800 M.c.f. of gas per day from Hoover sand perforations at 4,190-4,260 ft.; 1,500 M.c.f. per day from Chester - Mississippian at 7,052-7,102 ft.

ARK-LA-TEX

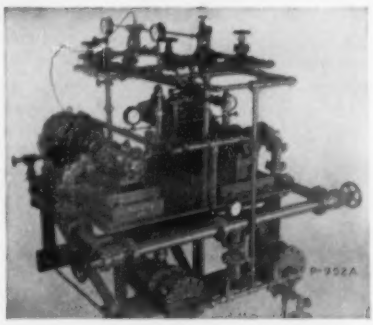
NORTH LOUISIANA

New Pay at Pine Island Reported

Williams Pressure Service 1 Graves Unit, 10-22n-15w, is a new-pay discovery in the Paluxy at Pine Island field, Caddo Parish.

COMPLETE RANGE OF SIZES AND MODELS IN BOTH MEDIUM AND HIGH PRESSURE TYPES

MORE COMPACT THAN EVER



P-952-A—Steam Turbine and Electric Motor drive gives flexibility in this compact Model P-ES2H size No. 25 unit.

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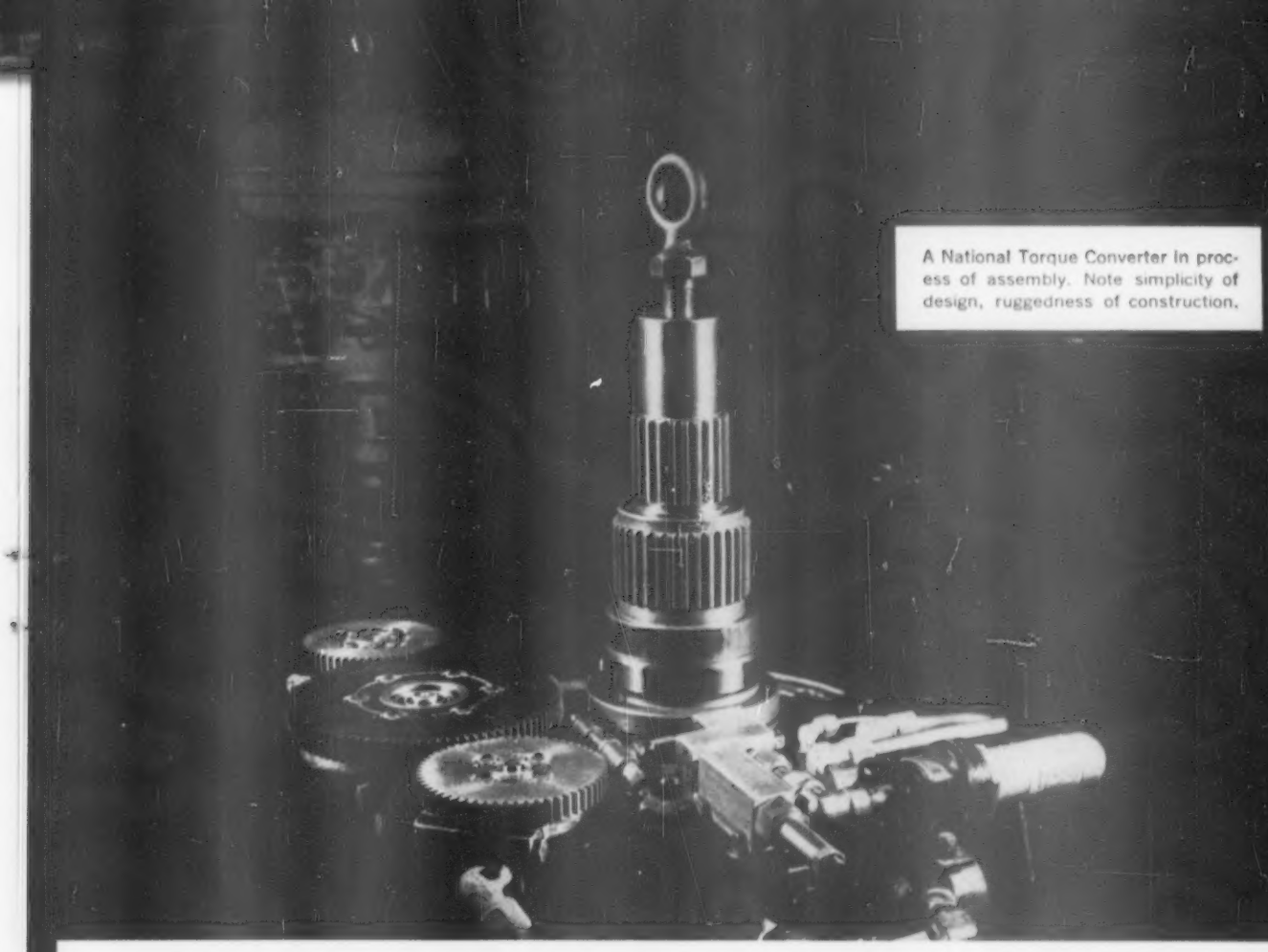

A National Torque Converter in process of assembly. Note simplicity of design, ruggedness of construction.

National Torque Converters are designed and built to fit your requirements

The simple, rugged design of National Torque Converters gives you many outstanding features such as these:

Easy installation of torque converter. Long equipment service life. Minimum maintenance of equipment and torque converter, even in toughest service.

With a National Torque Converter, engines reach full throttle quicker. Operations are smoother and less fatiguing for the drilling crew. Trip time is faster. Service life of engines, clutches, chains, pumps, bearings, even wire lines are greatly extended because of smooth power flow.

You have a choice of 6 basic hydraulic circuit sizes, each with a range of in-put ratings, permitting exact matching of torque converter to gasoline or diesel engines or electric motors of 100 to 1000 hp.

National Torque Converters are now available from *all* rig manufacturers. So whatever rig you buy or own . . . a Bethlehem, Brewster, Continental-Emsco, Joy, "Oilwell," Unit Rig or any of the others . . . be sure it has a National Torque Converter. You'll like its performance . . . its ruggedness . . . its "perfect fit" on the drilling rig of your choice. Always insist on a National Torque Converter.

THE NATIONAL SUPPLY COMPANY

INDUSTRIAL PRODUCTS DIVISION

Two Gateway Center, Pittsburgh 22, Pa.

Pace-setters in the progress of industrial power transmission

Completions By Depth Classifications—November 1956

	A 0-1,250 ft.	B 1,250-2,500 ft.	C 2,500-3,750 ft.	D 3,750-5,000 ft.	E 5,000-7,500 ft.	F 7,500-10,000 ft.	G 10,000-12,500 ft.	H 12,500-15,000 ft.	I Over 15,000 ft.
Alabama	0	0	2	0	1	0	4	0	0
Arkansas	4	52	24	14	6	0	0	0	0
California	17	54	46	31	28	15	4	6	0
Colorado	5	5	10	33	43	5	0	0	0
Florida	0	0	0	0	0	0	1	0	0
Illinois	37	153	102	3	0	0	0	0	0
Indiana	38	36	10	0	0	0	0	0	0
Kansas	2	32	197	106	27	0	0	0	0
Kentucky	96	57	19	3	0	0	0	0	0
West	94	56	7	0	0	0	0	0	0
East	2	1	12	3	0	0	0	0	0
Louisiana	4	57	31	12	40	51	55	35	13
North	4	56	26	4	29	6	3	1	0
South	0	1	5	7	6	30	40	28	8
Offshore	0	0	0	1	5	15	12	6	5
Michigan	2	6	10	6	0	0	0	0	0
Mississippi	0	0	1	6	14	4	3	1	0
Montana	2	4	8	9	11	7	0	0	0
Nebraska	0	0	4	7	39	0	0	0	0
West	0	0	2	7	39	0	0	0	0
East	0	0	2	0	0	0	0	0	0
New Mexico	2	35	37	50	29	3	4	10	1
Northwest	2	21	17	8	27	0	0	0	0
Southeast	0	14	20	42	2	3	4	10	1
New York	0	50	0	0	0	0	0	0	0
North Dakota	0	0	8	1	2	12	0	0	0
Ohio	18	18	54	2	0	0	0	0	0
Oklahoma	50	163	195	81	64	18	6	0	0
Pennsylvania	0	1	11	1	0	1	0	0	0
Texas	110	373	345	296	380	160	59	13	2
Dist. 1	16	22	32	13	9	0	2	0	1
Dist. 2	5	3	4	21	13	14	2	0	1
Dist. 3	7	7	8	14	44	74	17	0	0
Dist. 4	3	16	16	11	55	12	6	1	0
East	2	9	8	13	70	9	1	1	0
Dist. 7-B	16	55	55	58	42	0	0	0	0
West	5	70	111	121	86	42	30	11	0
Dist. 9	56	187	26	44	51	5	0	0	0
Dist. 10	0	4	85	1	10	4	1	0	0
Utah	3	1	2	3	16	1	0	0	0
West Virginia	2	25	13	15	0	0	0	0	0
Wyoming	19	20	14	9	18	4	4	0	0
Total Nov. 1956	411	1,142	1,143	688	718	281	140	65	16
Total Oct. 1956	534	1,274	1,233	739	735	347	132	69	16
Cum. 1956	5,141	12,946	13,094	8,248	7,901	3,819	1,548	729	127
Western Canada	1	48	28	122	71	19	2	1	0
Alberta	0	12	10	38	62	18	2	1	0
Saskatchewan	0	10	16	77	6	1	0	0	0
Manitoba	1	26	2	1	0	0	0	0	0
B. C.	0	0	0	6	3	0	0	0	0
Cum. 1956	17	344	366	1,040	981	192	24	9	0

The well flowed 216 bbl. of 46°-gravity oil daily on 14/64-in. choke, 1/10 per cent basic sediment and water included. Perforations are at 2,733-38 ft. in the Paluxy.

Justina Discovery Potentialed in Tensas

New Justina field in Tensas Parish, east-central Louisiana, has been potentialed. The discovery well, Michel T. Halbouty 1 Fisher Lumber Co., C NE SE 24-12n-10e, 2⅞ miles northeast of Justina, flowed 116 bbl. of 62°-gravity condensate and 2,000 M.c.f. of gas per day on 13/64-in. choke from perforations in the Massive zone of the Tuscaloosa at 8,373-80 ft.

Nearest such production is 2¼ miles west at Lake Formosa field.

EAST TEXAS

Salt Dome Test Is Near Objective

British-American Oil Producing Co. 1-B Bessie Weisenhunt, confirmation attempt at its Hainesville dome Woodbine discovery in Wood County, was coring after making initial tests in the Woodbine. At 9,508-55 ft., recovery was 170 ft. of drilling fluid, cut 80 per cent with 27° oil. Bottom-hole flowing pressure was 1,100 psi. Time on the test was 2 hours and 15 minutes.

Location of 1-B Weisenhunt is in the Wesley Tollett Survey, 6 miles northeast of Mineola, and 2,000 ft. southwest of the discovery. The firm's 1 Weisenhunt was completed last July for 259 bbl. a day, from perforations between 9,217-47 ft.

New pay in Joaquin field . . . A new zone in the upper Glen Rose has been opened in this Shelby County field by J. C. Mayfield 2 Pickering Lumber Co.

Calculated open flow potential was 24,500 M.c.f. of gas per day, plus 20 bbl. of condensate per 1,000 M.c.f. Pay section was perforated at 3,630-33 ft., and is designated the Mayfield sand.

Location is on the northeast flank of Joaquin field, 2 miles southeast of Joaquin, in Hezikiah Petite Survey, A-374. Nearest comparable production is approximately 45 miles to the northwest in Sligo field of Bossier Parish, Louisiana.

WEST TEXAS-NEW MEXICO

WEST TEXAS

Puckett Well Retested For Record Gas Flow

Phillips Petroleum Co. has recompleted its 2-D Puckett, 26-101-TCRR Survey, a Puckett field well. On the basis of engineering calculations the well has been given a daily potential of 2,400,000,000 cu. ft. of gas, the highest so far recorded in West Texas.

Initial tests rated the well at 570,000,000 cu. ft. per day. Production is from Devonian perforations between 10,356-10,678 ft.

Gas from Puckett field is taken to the Mid-West by Permian Basin Pipeline Co., from where it is distributed by Northern Natural Gas Co.

Pecos oil completion . . . Gulf Oil Corp. 1 McDonald-State, Wolfcamp discovery 9 miles south of Girvin, has made a calculated daily potential of 527 bbl. of 35° oil.

The figure was based on a 6-hour flow of 131.79 bbl. of oil through 18/64-in. choke, from perforations at 4,630-75 ft. Flowing tubing pressure was 200 psi. Earlier reports were said to have identified the pay as Permo-Pennsylvanian.

Standard Oil Co. of Texas 1-30 Frank A. Perry, Ellenburger prospect 9 miles southwest of Bakersfield, in Pecos County, pumped 81 bbl. of oil and 4 bbl. of water in 24 hours. Production was through perforations at 10,410-48 and 10,590-10,630 ft.

Standard of Texas has set casing at 9,575 ft. at its 4-2 Owens in 4-C4-GC&SF Survey, for completion as a 1-mile north extension to Ellenburger production in the Sheffield field, 10

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PGAC-565

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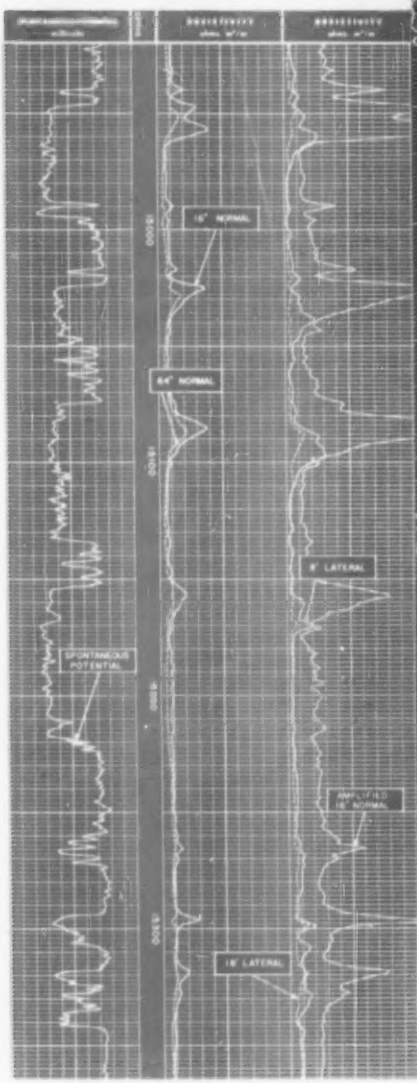
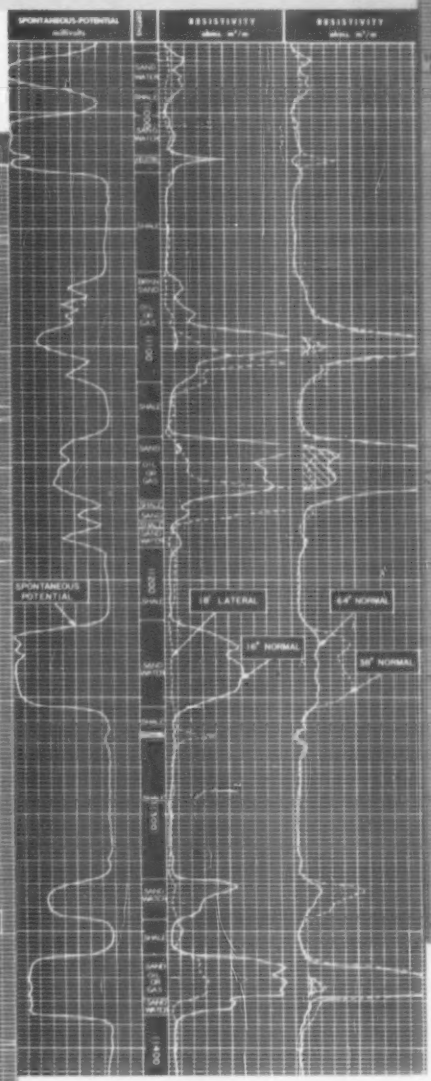


PGAC Electrical Log, Type P-2N-2L
For Gulf Coast Formations



PGAC Electrical Log, Type P-NL-2N
For Oklahoma Formations

PGAC Electrical Log, Type P-3N-L
For Venezuela Formations

CODE TO LOG TYPES:
P—Spontaneous Potential
N—Normal Curve
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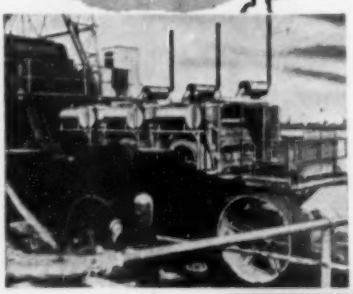

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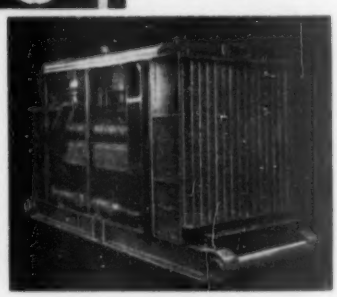

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J-19

miles southeast of Iraan. Drill-stem tests at between 9,306-83 ft. flowed oil.

Reeves County . . . Bone Springs oil has been indicated at Gulf Oil Corp. 1 Worsham, wildcat 12 miles southeast of Pecos, in 10-C6-PSL Survey. A 2½-hour test at 8,278-8,361 ft. had a small gas flow in 35 minutes, and recovered 115 ft. of 36° oil. Drilling continued on an 8,500-ft. contract.

Virey field extended . . . Forest Oil Corp. and Cities Service 1-C-3 Dora Roberts, 34-41-T3S-T&P, has extended Devonian production 1 mile west of Virey field in Midland County.

Completion potential was 312 bbl. of 53° oil, from perforations at 11,804-12,034 ft. Tubing pressure was 1,150 psi, and gas-oil ratio 4,028:1.

More Pay Indicated In Winkler Well

Humble Oil & Refining Co. 2 Waddell Bros., new-pay discovery in Circle 2 field, 13 miles east of Kermit, has logged additional pay in the Fusselman.

On one of the initial tests in the Fusselman, 4,806 ft. of oil was recovered from the interval at 9,728-60 ft. At 9,760-85 ft., operators reversed out 16 bbl. of 32° oil, and on the last test reported, from 9,785-9,810 ft., recovery was mud with no shows.

The well has also indicated Devonian production, regular pay for the area, by flowing 40 bbl. of oil in 2 hours while testing at 9,220-41 ft. Circle 2 field discovery, Humble 1 Waddell Brothers, recovered oil and sulfur water in the Fusselman at 9,785-9,813 ft.

SOUTHEAST NEW MEXICO

Lea County Strike Completed

Tennessee Gas Transmission Co. 1-A State-Kemnitz, 25-16s-33e, has been completed as a Permo-Pennsylvanian discovery, flowing 412 bbl. of oil a day. Its daily potential was based on a 4-hour flow of 68.75 bbl. of oil through 28/64-in. choke.

Roosevelt County . . . Magnolia Petroleum Co. 1 Vallie Whitehead, Pennsylvania prospect 7 miles southwest of New Hope field, in 32-6s-34e, Roosevelt County, has been plugged back to 8,057 ft. in an attempt to complete as a discovery.

The well indicated production on a drill-stem test at 7,979-94 ft. Gas flow from that interval was rated at 5,400 cu. ft. daily; recovery on another test at 8,010-31 ft. was 80 ft. of oil and gas-cut mud.

Sinclair Oil & Gas Co., and others have confirmed a new Pennsylvanian lime pool in Lea County, New Mexico, by completing 2 Seaman Unit, NW NW 19-16s-34e, to extend the pay reserve to the southeast.

The well swabbed 112 bbl. of 44.6°-gravity oil in 24 hours from perforations opposite the Pennsylvanian Strawn at 11,332-66 ft. Total depth is 11,500 ft., with 9⅝-in. intermediate casing at 4,568 ft. and 5½-in. pipe set at 11,499 ft.

The pool, located 7 miles southeast of the Saunders pool and west of the town of Lovington, was opened at 1 Seaman Unit, SE SE 13-16s-33e.

The new pool is on a 1,522-acre unit block, with Sinclair as operator. Others with interests in the unit are Shell Oil Co., Cities Service Oil Co., and Skelly Oil Co.

Sinclair and others' 3 Seaman Unit, NE SE 24-16s-33e, south offset to the discovery well, drilled below 9,696 ft. on a Pennsylvanian test.

APPALACHIAN

OHIO

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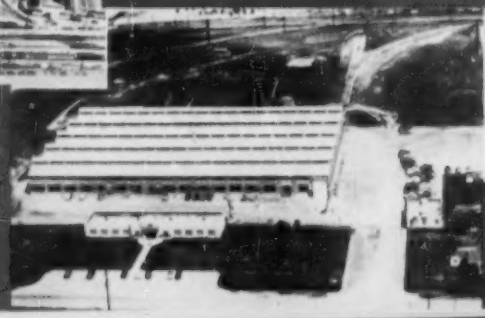

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Township, Wayne County, an area in which the company is drilling several wells. On 1 George Grabor, Section 36, the White Clinton was logged at 3,845-63 ft. with 4,000,000 cu. ft. natural and 17,300,000 cu. ft. after fracture.

• The E. H. Everett Co. 6 Frank Westbrook, an outside location in Black Run pool, gaged 220 bbl. in 24 hours after fracture. In Lot 1, Perry Township, Licking County, the Clinton was found at 3,037-87 ft.

• A second gasser was completed north of Glenford pool in Hopewell Township, Perry County. Foraker 2 E. Noyes, Section 4, topped the Clinton at 2,724 ft. and gaged 720,000 cu. ft. natural.

WEST VIRGINIA

In Dry Fork district, Randolph County, West Virginia, Columbian Carbon Co. 1238 U.S.A., Department of Interior wildcat, elevation 3,083 ft., completed at 582,000 cu. ft. gas, chert 5,045-5,174 ft., Oriskany sand 5,210 ft., gas at 5,326 and 5,396 ft., TD 5,400 ft.

• Kentucky district, Nicholas County, Rotary Development Corp., located its second wildcat 1-A New Gauley Coal Corp., elevation 2,552 ft., Richwood Quadrangle, 4.90 miles south of latitude 38 degrees 15 minutes and 3.45 miles west of longitude 80 degrees 35 minutes.

• Licking district, Tucker County, Hope Natural Gas Co. 10009 Thaddeus Pritt, elevation 1,812 ft., recorded the Tully at 3,785-3,820 ft., and is drilling at 4,080 ft.

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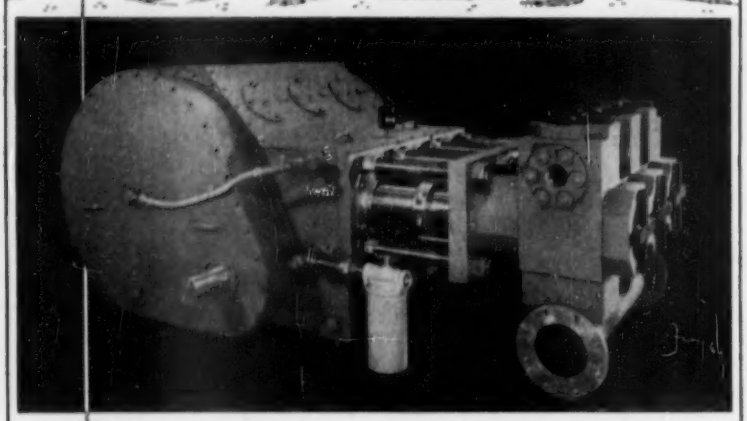

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ROCKY MOUNTAIN

WILLISTON BASIN

Here's the Rundown On Yearend Success

Amerada Petroleum Corp. is still testing at its Outlook area Silurian discovery prospect in Sheridan County, extreme northeastern Montana. The best flow yet at the well was 20 bbl. per hour. Successful completion here will certainly give a new exploratory impetus to this portion of the Williston basin.

North Central Oil Co. is completing a Mission Canyon-Mississippian discovery in Bottineau County, 13 miles southwest of Kuroki field in North Dakota. Other important Williston happenings include Texota Oil Co.'s apparent Burke County Mississippian discovery, 25 miles northeast of big Tioga field.

CENTRAL MONTANA

Another Wolf Springs may be in the offing for Central Montana as a result of Texota Oil Co.'s apparent Amsden discovery at 1 Goffena, C NW NE 26-9n-27e, Musselshell County, 25 miles northwest of the best Amsden field of them all, Wolf Springs.

Texota recovered 4,400 ft. of 40°-gravity oil on a 3-hour drill-stem test of the Amsden at 6,278-94 ft. The indicated discovery is 6 miles southeast of Gage dome, 3½ miles northwest of the town of Delphia. There has been no drilling in the immediate area. Those interested in the Amsden's worth in Montana will watch this well with keen interest. Successful completion would make it one of the Northern Rockies' best strikes of 1956 or possibly early 1957.

LAS ANIMAS ARCH COUNTRY

Wildcatting is picking up again in southeastern Colorado along the Las Animas arch. Several wildcats are under way in the southeastern counties. Stanolind Oil & Gas Co. has a small Morrow-Pennsylvanian gas strike 12½ miles southeast of Bents Fort field, Kiowa County. Oil shows were reported at a Baca County wildcat, 26

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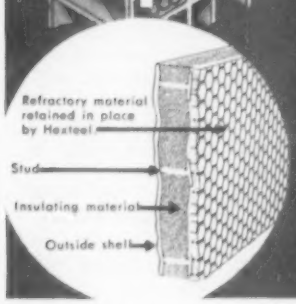

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miles west of big Greenwood gas field, a Kansas-Colorado producing area. Wildcats are going in Baca, Prowers, Crowley, and Kit Carson counties, southeastern Colorado.

PICEANCE CREEK BASIN

Western Colorado's wildcat interest is centered in the Buck Peak area, Moffat County. A wildcat here recovered 8,800 ft. of oil on test below 9,000 ft. Location is 7 miles northeast of Moffat field, a Cretaceous and Jurassic producer. No drilling has been done in the linking areas between the two fields.

POWDER RIVER BASIN

Mobil Producing Co. has an apparent Dakota-Cretaceous discovery 5 miles southwest of Donkey Creek in the Powder River basin of Wyoming. Focal points of current widespread wildcatting in this basin are: Crook, Campbell, and Niobrara counties.

DENVER BASIN

The California Co. has a Permian discovery in Weld County, 4½ miles south of Black Hollow-Permian field in northeastern Colorado. This is the first pre-Cretaceous excitement in the Denver basin since Pierce field was opened last year (1955) in Weld County.

FOUR CORNERS

The Aneth trend of southeastern Utah's Paradox basin region continues to hold top spot in Rocky Mountain exploratory interest. The latest important extension is Gulf Oil Corp.'s wildcat in 1-41s-22e, San Juan County, 3½ miles southwest of Recapture Creek, the west anchor to the Aneth trend. Gulf recovered commercial oil on tests at this wildcat.

Carson area . . . Anderson-Prichard Oil Corp.'s Gallup sand discovery 3 miles east of Shell's Carson discovery in San Juan County, northwestern New Mexico, flowed 25-35 bbl. of oil per hour on tests. This strike and the Carson area activity east of Bisti proper.

UTAH

Boundary Butte Extension Tested

Western Natural Gas Co. 6 English, SE SE NE 16-43s-22e, San Juan County, reported a flow of 15½ bbl. of oil per hour on initial tests at 4,285-99 ft. Flow was natural on ½-in. choke. This extension is 1 mile northwest of Boundary Butte field.

Aneth Report

The Texas Co. 5 Navajo C, E½ NW NW 24-40s-24e, San Juan County, was completed flowing 1,176 bbl. of oil per day on 1-in. choke in the Pennsylvanian, moving Aneth production southeast. This well is on the southeast edge of the Aneth production.

Paradox Basin Operations Continue to Increase

Carter Oil Co. announces an expanded drilling program in the Paradox basin. The firm will drill four wildcats and two field wells immediately, both in southwestern Colorado and southeastern Utah.

The new locations include the 1 Anido Creek, NE NW 33-43s-26e, 2 Bluff Bench Unit, SW SE 5-39s-22e, San Juan County, Utah. This well will test the Paradox to 6,000 ft. Carter will drill a third well here following completion of the 2 Bluff Bench Unit.

A wildcat will be drilled soon in 36n-20w, Montezuma County, Colorado. Testing will be to 6,100 ft. in the Paradox. Carter 1 State-Wooley, SW SW 16-40s-26e, northeast offset to East Aneth field, is an apparent success. Testing is under way in the

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Pennsylvanian at 5,635 ft. A second well is scheduled for this section. They will also drill a northeast diagonal offset to the West Desert Creek area discovery, a recent Gulf Oil Corp. strike in SW SW 31-40s-23e.

NORTH DAKOTA

Spearfish Discovery In Bottineau County

Leach Oil Co. has an indicated Spearfish-Triassic discovery in Bottineau County. The 1 Smith, SW SW 14-162n-80w, recovered 350 ft. of gassy oil on drill-stem test at 3,425-30 ft. Pipe recovery included 1,700 ft. of gas and 35 ft. slightly oil-cut mud. Drilling continues below 3,430 ft. Location is 9 miles southeast of Kuroki field, and 4 miles south of Westhope, N. D.

MONTANA

New Pay Discovery At Cabin Creek

Cabin Creek field in Fallon County has a new pay discovery well, Shell Oil Co. M-42-29 Unit, C SE NE 29-10n-58e. Production is from Mission Canyon-Mississippian at 7,298-7,324 ft.

The well flowed 305 bbl. of oil and 37 bbl. of water per day on 11/64-in. choke. This is the first Mississippian producer in this field. Other production at Cabin Creek is Ordovician and Silurian.

Heath Oil Found at Melstone Wildcat

Lawrence Barker, Jr. recovered 2,700 ft. of oil on a drill-stem test at 4,229-35 ft. in the Heath-Tyler. The well is the 1 Hougen et al., NW SW NW 22-10n-29e, Musselshell County. This well is about 2 miles west of Melstone field and 10 miles southwest of Ragged Point field. Location is 12 miles northeast of the Amsden discovery at Texota Oil Co. 1 Goffenna, C NW NE 26-9n-27e, Musselshell County.

NORTHWEST NEW MEXICO

Rank Wildcat Reports Oil and Gas Shows

Oil and gas shows were reported at Stanolind Oil & Gas Co. 1 Hoover, a rank wildcat in SE NW SW 23-30n-16w, San Juan County, northwest of San Juan basin gas fields and 7 miles northeast of Hogback field, 8 miles southwest of South Barker Creek.

The well is due to test granite, and is now drilling below 10,335 ft.

Dakota Discovery Tested at West Kutz

Stanolind shut in 1 Davies, SE NW NW 27-28n-13w, San Juan County, after gaging 5,368 M.c.f. of gas per day. This well is located 2 miles west of West Kutz field. Dakota production is a new pay for the area.

WYOMING

Two Wells Completed At East Salt Creek

Two Tensleep oil wells were reported at East Salt Creek field, Natrona County. Sinclair 9 Government, C NE NW 15-40n-78w, had a calculated potential of 1,161 bbl. per day from the Tensleep; the 1 Government-Roripaugh, SW SE NW 10-40n-78w, a King et al well, flowed 720 bbl. of oil per day.

The discovery well in this Tensleep play is Sinclair 8 Government, SE NW SW 10-40n-78w, was finaled for 1,944 bbl. of oil per day on calculated potential recently. Its discovery set off a rapid Tensleep evaluation program at East Salt Creek.

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LOUISIANA GULF COAST

Cut Off Extension Well Opens Another Pay Zone

California Co. is opening another pay zone in the Cut Off area, in Lafourche Parish. It is in the company's 1 Bailey, ¾ mile northwest of previous production.

Pay is perforated at 10,872-85 ft., and tested 228 bbl. of 38.9°-gravity oil per day, flowing through ⅛-in. choke with pressure of 1,640 psi.

Other producing zones in the area range in depth from 9,300 to 11,500 ft.

Ragley Outpost Narrows Gap Between Bear Field

Gasoline Producing Co. has narrowed the gap between Ragley and Bear fields, in southeastern Beauregard Parish, with completion of a high-ratio oil well in its 1 Richey, located between the two fields.

The well was drilled as a west extension to Ragley field, but is less than 2 miles northeast of Bear field. Both fields are productive from Frio sands.

Pay zone of the link well also is in Frio sand, perforated at 7,230-36 ft. Production of the well is placed at 40 bbl. of 39.3°-gravity oil and 2,000,000 cu. ft. of gas per day, flowing through 9/64-in. choke with pressure of 2,450 psi. Total depth is 7,293 ft.

Definite Location For Hunt Deep Hole

General Crude Oil Co. has made definite location announcement for a deep Smackover lime wildcat, 8 miles northeast of Greenville in northeastern Hunt County.

The 9,500-ft. well will be the 1 M. L. Johnson, on an 85-acre tract and 1,500 from the north and 2,272 ft. from the east lines of John Christian Survey, A-165. The well will be located about 1 mile north of Campbell-Paluxy sand oil pool and on a lease block of some 3,000 acres.

Second Well Confirms Ponchartrain Discovery

Humble Oil & Refining Co.'s second well in the field it discovered last July in Lake Ponchartrain, offshore from Jefferson Parish, is good for 148 bbl. of 34.6°-gravity oil per day through ⅛-in. choke.

The well is productive with a gas-oil ratio of only 527 cu. ft. per barrel with pressure of 1,175 psi. Humble's

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initial well, in the same Block (37), was a high-ratio well, making 60.25 bbl. of 36.2°-gravity oil per day through ⅝-in. choke with 26,738 cu. ft. of gas per barrel.

Producing interval of the second well, on State Lease 2915, is 7,476-85 ft. That of the first well, on Lease 2,914, is 7,488-93 ft.

Location of the field is in the southwestern part of the lake, just northwest of New Orleans.

Bayou Postillion Field Adds Third Pay Zone

Bayou Postillion field, in Iberia Parish, is getting its third well, and its third pay zone in the completion by Humble Oil & Refining Co. of its 1 McKerrall and others with perforations at 11,708-17 ft. The well tested 126 bbl. of 36°-gravity oil per day through ¼-in. choke, recording pressure of 1,050 psi.

Humble's discovery well, completed last January, is productive from pay at 12,450-55 ft. Its second well, completed last November, produces from interval at 11,856-62 ft.

LOUISIANA OFFSHORE

Vermilion Area Wildcat Completed as Gas Well

Another Louisiana offshore prospect has been proved productive. It is in Block 46, Vermilion area, 10 miles off the coast of Vermilion Parish, in the Gulf of Mexico.

Discovery is by Magnolia Petroleum Co. on State Lease 883 (OCS 079). Initial production is wet gas from pay-perforations at 6,556-68 ft. Completion flow was at the rate of 2,817,000 cu. ft. of gas per day, testing through 7/32-in. choke. Pressure was 2,468 psi. on the tubing. Liquid recovery was at the rate of 9.6 bbl. of condensate per day with ratio of 23,000 cu. ft. per barrel.

The well was drilled to 13,541 ft. and has 5-in. liner to 12,534 ft.

WEST CENTRAL TEXAS

Fisher County Pool Gets Confirmation

A new Cisco sand pool in Fisher County was confirmed. The new producer is Miami Operating Co. 1 W. A. Blount estate, confirming new Roby-Goolsby pool. The new well gaged 25 bbl. of oil per day on pump from open hole at 3,887-3,904 ft. Location is 1 mile northwest of Roby in T. H. Crosby Survey 315, a southeast offset to the field discovery well, the 1 Goolsby.

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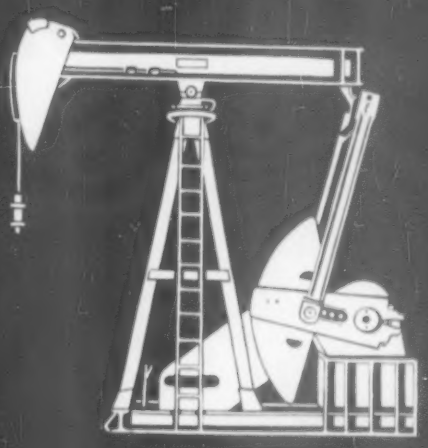

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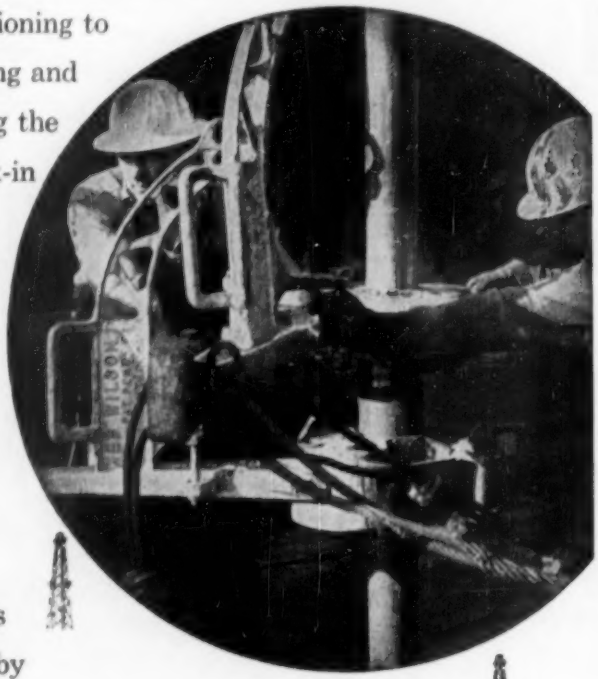

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SOUTH TEXAS

SOUTHWEST TEXAS

Hagist Ranch Wildcat Gets Gas in Deeper Pay

Texas Eastern Transmission Co. and Forney-Worrell have a gas-discovery well at their 1 Hagist Ranch, Inc., about 1½ miles north of Hagist Ranch field, in southern McMullen County.

It is rated good for 1,500,000 cu. ft. of gas daily, open-flow potential, from pay at 6,647-52½ ft. Pressure through 7/32-in. choke is 1,066 psi. Gas-oil ratio is 245,700 cu. ft. per barrel.

Hole had been drilled to 8,496 ft. before being plugged back to the present gas sand.

Location is in an unnamed area where one well previously had been completed in a shallower pay.

Gas Production Tested In Cage Ranch Discovery

Associated Oil & Gas Co.'s newly completed discovery well in the Cage Ranch area, 7½ miles southwest of Falfurrias, in northern Brooks County, flowed at a calculated open-flow rate of 4,600,000 cu. ft. of gas per day during its official potential gage.

The well, 5-B Cage, opens a new producing zone, perforated at 7,156-66 ft. It was drilled to 7,931 ft. Shut-in pressure is 2,565 psi.

Starr County Wildcat Flows Gas-Distillate

Claud B. Hamill and associates are opening another productive area in northeastern Starr County, near the Hidalgo County line.

Their discovery well, 1 Bentsen Brothers, flowed gas and condensate while cleaning from perforated interval at 5,811-17 ft. Flow was not gaged, and the well is shut in pending potential gage.

The well was drilled to 8,495 ft., and is cased to 6,000 ft.

Location is in the G. O. Newman Survey, Section 6. It is about midway between El Benadito field, about 2 miles west, and Arrowhead field, eastward on the Hidalgo County side of the line.

Deep Zone Produces in Duval County Discovery

Another gas and condensate producing area is being opened in Duval County. It is about 8 miles southwest

of Manuel, in the Santa Anita Manuel Gomez Survey, where Slick Oil Corp. and W. C. Dunlap, Jr., are completing their 1 Arcadio Guerra wildcat in a deep pay, perforated at 8,488-8,522 ft.

Tested through 13/64-in. choke, the well flowed at the rate of 1,070,000 cu. ft. of gas per day, recovering 18½ bbl. of condensate with 18 bbl. of water. Flow was under pressure of 1,380 psi. Shut in, pending potential tests, pressure is 4,250 psi.

TEXAS GULF COAST

Davis Hill Area Gets Second Discovery Well

Exploration on and around the old Davis Hill dome, in northern Liberty County, is being rewarded with its second oil discovery.

It is a wildcat drilled by Texas Gas Exploration Corp. about 3½ miles east of the area's initial, and so far, only oil producer, completed in July 1955 by The Texas Co.

Texas Gas Exploration Corp.'s well, 1 Swilley Estate, in the Santos Coy Survey, is rated good for 150 bbl. of 35°-gravity oil per day, flowing through ⅛-in. choke. Pressure is 920 psi., flowing, and 1,000 psi., shut in.

Production is from perforated interval at 6,604-08 ft. in hole drilled to 8,003 ft.

Texaco's discovery well produced initially at the rate of more than 190 bbl. of 46.5°-gravity oil per day through 5/32-in. choke from perforated interval at 6,768-80 ft.

Both wells are off the east flank of the dome, known as a dome and explored spasmodically since early in the century. Three deep flank wildcats drilled since Texaco's discovery have been dry.

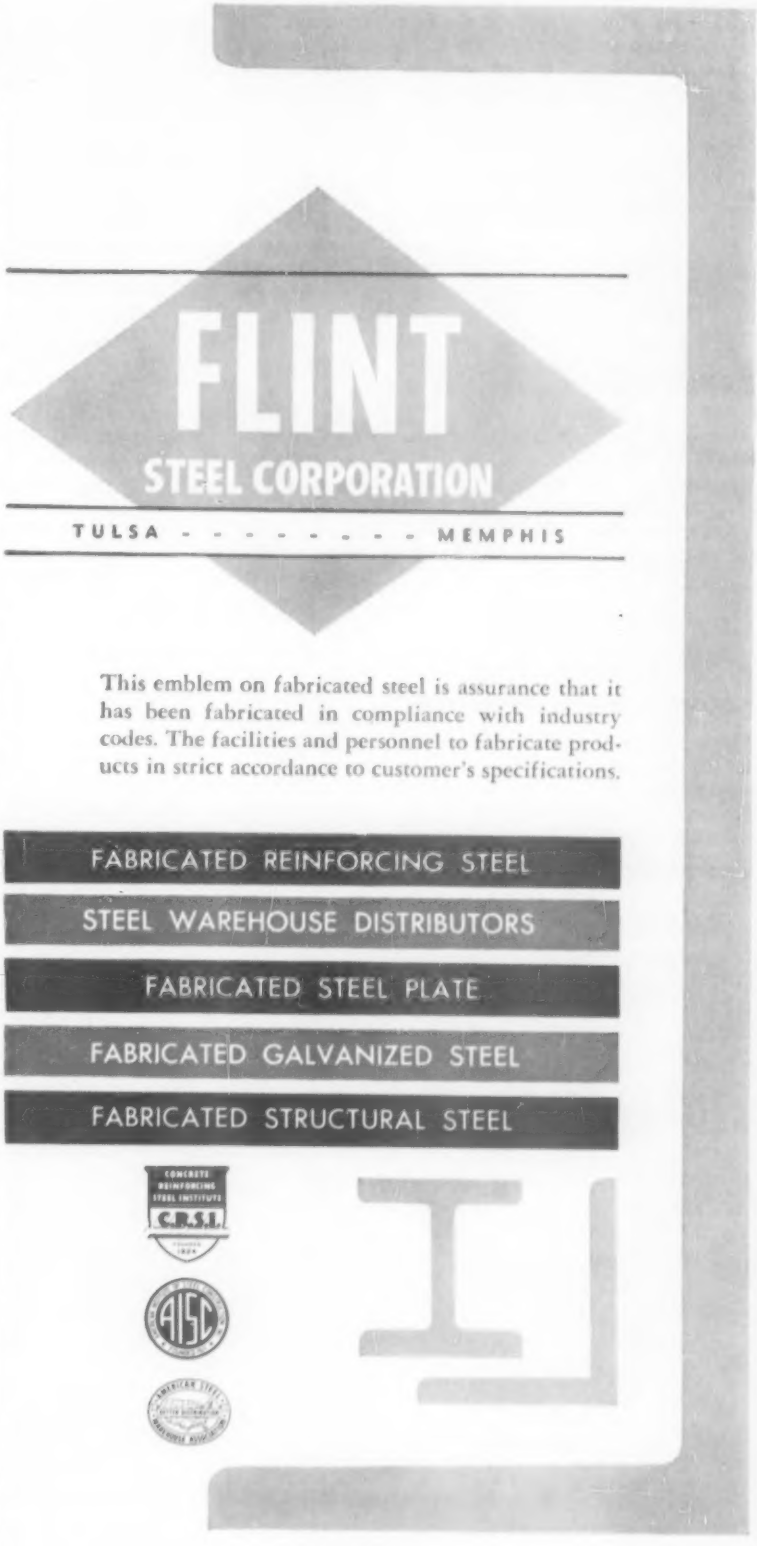
Gas Production Proved In Alief Area Wildcat

Standard Oil Co. of Texas has uncovered another gas-productive reservoir in the general Alief area, southwest of Houston, in southwestern Harris County.

Its discovery well, 2 Louise Synnot, is rated good for 45,000,000 cu. ft. of gas per day, open-flow potential, with production from Yegua-Cockfield sand. Pay is perforated at 8,294-8,300 ft.

Completion is in sidetracked hole drilled to 8,474 ft. Original hole was drilled to 8,866 ft. and plugged back to 6,764 ft.

Gas is wet, yielding 22.95 bbl. of 56.7°gravity condensate per 1,000,000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cu. ft. of gas. Flowing pressure through 7/32-in. choke was 2,685 psi.

Location is about 1¼ miles southwest of Alief, and about 3½ miles southwest of Alief production.

Anahuac Townsite Well Opens New Gas Reservoir

Group Oil Co.'s newly completed discovery well in the townsite of Anahuac, 4 miles west of Anahuac field, flowed at the rate of 15,000,000 cu. ft. of gas per day for its official potential gage. Gas carried a spray of 53.6°-gravity condensate. Shut-in pressure of the well is 3,148 psi.

The well's Frio pay is perforated at 8,607-17 ft. Total depth is 8,750 ft.

Location, on the east shore of Trinity (upper Galveston) Bay, also is about 1½ miles northeast of Trinity Bay field, in the bay.

NORTH TEXAS

Big Conglomerate Well Completed in Throckmorton

Throckmorton County has a prolific new conglomerate discovery well at Simpson Hines Oil Co. 1 R. O. Huston, 4½ miles south of Throckmorton town in Section 295, BBB&C Survey. The well flowed 528 bbl. of oil per day on 16/64-in. choke from perforations at 4,746½-48½ ft. The new area has been named Huston-Conglomerate.

EASTERN KENTUCKY

On Left Fork of Elkhorn Creek in Leslie County, United Fuel Gas Co. is drilling at 1,150 ft. on their 28 Fordson Coal Co., a projected deep Cambro-Ordovician wildcat. Well is located northeast of town of Sizerock.

N.O.S.L.A. Officers

Directors of the National Oil Scouts and Landmen's Association met December 8 in Dallas. The association is composed of 38 district groups located in the United States and Canada. Directors control the policies of the association's publication, a 1,200-page yearbook on oil and gas development. The book is widely used by libraries and oil men all over the world.

Officers of the association are: Kelly Scott, president (Superior Oil Co.); Frank W. Wood, Jr., first vice president (Atlantic Refining Co.), Midland, Tex.; A. T. Murphy, second vice president (Shell Oil Co.), Denver, Colo.; E. D. Bell, third vice president (Shell Oil Co.), Calgary, Alta., Canada; Dan Ottinger, secretary-treasurer (Stanolind Oil & Gas Co.), Lake Charles, La.; T. H. Robinson, editor-in-chief (Phillips Petroleum Co.), Evansville, Ind.; Wiley W. Wiggins, immediate past president (Atlantic Refining Co.), Tyler, Tex.

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WESTERN CANADA

ALBERTA

Nine Wildcats Make Canadian News

Nine exploratory wells made the news in Western Canada's oil and gas industry during the past 7 days. Eight of the tests, five in Alberta and the remainder in Saskatchewan previously had indicated production through drill-stem test operations run during the drilling of the wells and are currently being production tested; while the other well, a wildcat in northwestern Alberta, indicated discovery when oil was recovered from the drill pipe upon completion of a drill-stem test.

● The most significant of the Alberta wells is the Texaco A1-25 High River venture which lies in the southern sector of the province, on LSD 1, 25-18-30w4, 30 miles south of Calgary's city limits. That well flowed oil from the D1 zone of Devonian through a 13-ft. perforated interval below 9,625 ft. Flow rate was calculated at 326 bbl. per day through a restricted choke. Total depth of the venture is 10,028 ft. and production casing is set at 10,028 ft.

● Canadian Oil Companies, Ltd., and Plymouth Oil Co. have placed their D3 zone of Devonian oil discovery well, White Rose-Plymouth 1 North Stewart Lake, LSD 1, 4-33-26w4, on production with an initial flow rate of 276 bbl. of oil per day. The crude is coming from a 3-ft. perforated interval below 7,335 ft. After the zone was cleaned with an acid wash, the well commenced to flow. Rate was measured through various sized chokes and gas-oil ratio is approximately 1,250 cu. ft. per bbl.

Another D3 zone oil discovery well, drilled by Dome Exploration (Western), Ltd., on farmout acreage it acquired from Texaco Exploration, Ltd., also rewarded its backers with commercial success during recent production test operations. This well, Dome-Texaco I-5 Wizard Lake, on LSD 1, 5-48-27w4, is currently undergoing a series of tests after swabbing operations of a 10-ft. interval below 6,900 ft. brought the well in. Latest available report had the well flowing 3½ bbl. of oil per hour through a restricted choke.

● The Red Earth Creek area of northern Alberta, was warmed up even further as Union Oil Co. 12-16 Red

Earth well, on LSD 12, 16-87-8w5, was flow tested for 5 days and averaged about 170 bbl. of clean crude daily from the Granite Wash horizon. The venture was drilled 1 mile due east of the company's initial discovery well, Union 12-17 Red Earth. Two intervals were perforated covering a total of 30 ft. and production was rated through a small sized choke.

The other Alberta test to indicated commercial success was drilled in the Claresholm area of southern Alberta by Sinclair Canada Oil Co. This well was completed from the Colorado section of the Cretaceous and a calculated pump potential was estimated at 120 bbl. of oil per day. The well, Sinclair C&E 1 Dahl, on LSD 7, 7-13-27w4, was carried to total depth 8,467 ft. and a 26-ft. section below 5,506 ft. was perforated for swab tests.

The new indicated discovery in the province is being drilled by Stanolind Oil & Gas Co., Ltd., in the Cutbank River area of northwestern Alberta. This rank wildcat, Stanolind A-1 Big Mountain, on LSD 3, 26-66-7w6, about 30 miles south and slightly west of Grande Prairie town, recovery 42 ft. of clean oil that graded at 49° on drill-stem test in the Triassic sand. There was also a 2,000-ft. recovery of oil and mud-cut water cushion made. At the present time it is not possible to guess at the prospects of the well as the interval tested was 177 ft. below the 9,380-ft. level. Crew is now running casing at the hole.

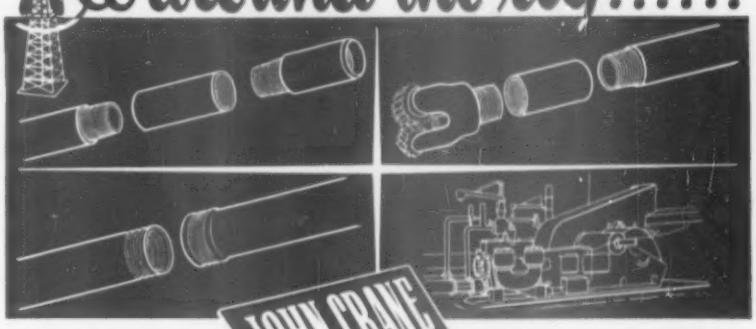
Saskatchewan

● The Saskatchewan developments during the past week took place at Canadian Delhi Oil Co., Ltd., Phillips Petroleum Co., Husky Oil & Refining, Ltd., and Richfield Oil Corp.'s 1 Garden wildcat venture in the Bone Creek area of southwestern Saskatchewan; McCarty & Coleman's oil discovery well in the South Manor area of Southeast Saskatchewan; and Tidewater Oil Co.'s indicated success in the Dalesboro region 6 miles west-northwest of the McCarty & Coleman strike.

● The 1 Garden well, on LSD 4, 25-10-20w3, 4 miles west of the Bone Creek oil field, rated an initial potential of 120 bbl. per day through a 4-ft. section around 4,395 ft. McCarty & Coleman's South Manor test, on LSD 8, 23-6-1w2, was completed as a commercial success after 2 days' production gave up oil at rates of 104 and 83 bbl. per day respectively.

● The Tidewater 1 Dalesboro Crown venture, on LSD 16, 26-6-2w2, meanwhile, will have to undergo further testing operations before its worth is known. The most recent production data at that hole was not too encourag-

All around the rig.....



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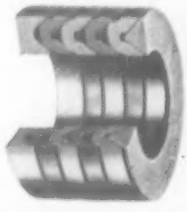

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ing as those operations gave up 80 bbl. of fluid during initial tests. That fluid consisted of 45 per cent oil and the remainder was water. This production, like the South Manor well, is coming from the Mission Canyon sector of the Mississippian, through a 4-ft. perforated section.

BASIN AND RANGE

NEVADA

Nevada Activity

Five miles south of Las Vegas Joe W. Brown was coring below 6,597 ft. on 1 Wilson-Federal making it the deepest test drilled in Clark County. At the other end of the state in Elko County, Richfield Oil Corp. was drilling and coring below 1,947 ft. on 1 Scott-Ogilvie-Federal.

GREAT LAKES

MICHIGAN

Possible new Gratiot County Alpena Traverse oil well, Moco 1 Hoxie, SE SE NE 36-12n-4w, Seville Township, made two head flows during casing and tubing operations, an estimated total of about 100 bbl. of oil. Well was flowed to pits, about 35 bbl. first flow, late last week, and about 50 to 65 bbl. second flow about 3 days later. Pump testing is scheduled. Traverse oil pay was logged in the Alpena section at 2,890-95 ft. Hole carried 1,700 ft. of free oil natural first 20 hours after pay was drilled.

• Daily per-well allowable for Dundee-Reed City zone oil producers in Reynolds pool, Montcalm County, was ordered cut to 60 bbl. a day, effective January 1, 1957, by Supervisor of Wells Gerald E. Eddy. Order was issued following a public hearing in Lansing on December 17 to review the pool. Current allowable permits withdrawal of 75 bbl. per day.

An abnormal (according to state engineers) drop in static bottom hole pressure in this limited water drive pool, prompted this review and cut in per-well allowable. Reynolds spacing is one well to each 40-acre tract. Operators indicated that a secondary recovery, water flooding program would be started in the pool immediately. Dry holes now completed around pool will be used as injection wells. Water source will be the Traverse formation. On the northwest side of the pool, where about 300 bbl. of water daily from a Traverse oil producer is being injected into Dundee-Reed City zone porosity, the decline in bottom-hole

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pressure has been leveled off. The Supervisor and State Advisory Board will look at the Reynolds field pressures again in February. State engineers recomended a cut to 50 bbl. per well at the December 17 hearing.

PACIFIC COAST

CALIFORNIA

New Fault Block Pool at Vallecitos

Franco Western Oil Co. chalked up a new fault block pool discovery 2 miles east of the F & I pool activity in the Vallecitos region of San Benito County. Franco brought in 52A-33 Ashurst on the pump for 45 bbl. daily of 35°-gravity crude from 3,313-38 ft. Originally drilled to 4,799 ft., Franco plugged the test back to 3,396 ft. for the completion.

Neaves Set to Whipstock First LaHonda Offset

Neaves Petroleum Developments has plugged back its first LaHonda field extension test for a whipstock redrill job. Neaves took this southeast extension to 3,500 ft. before deciding to plug back and kick it out in another direction. It is located about 660 ft. from the LaHonda discovery well in San Mateo County.

Richfield Misses Again at "Z" Pool

Richfield Oil Corp. missed for the second time on its efforts to extend production at its "Z" pool discovery in the Windgap area of Wheeler Ridge field in Kern County. This latest effort, a northeast offset, was taken to 12,115 ft. before Richfield decided to plug and abandon. Last June Richfield quit at 10,019 ft. on an extension test 900 ft. southeast of the discovery. Thus far the discovery well, 52F KCL, is the only producer Richfield has been able to get in the pool it discovered last March about 2 miles southeast of regular Wheeler Ridge production.

Texaco Gets Two More Big Bridge Pool Wells

The Texas Co. continued to bring in excellent wells in the Bridge area pool of South Mountain field in Ventura County. Two recent completions on the east flank of the Bridge pool activity were brought in flowing 857 bbl. and 1,656 bbl. daily, respectively. One, 1B Richardson Ranch, was taken to 8,385 ft. before being plugged back and completed for 857 bbl. daily of 32.5°-gravity crude from 6,539-7,330 ft. The other, 1 Texas-Union Oil-Taylor, was brought in flowing 1,656 bbl. daily of 29.3°-gravity crude from 6,543-8,070 ft.

Successful Wildcats

ALBERTA

Dome Texaco 1-5 Wizard Lake, LSD 1, 5-48-27w4. TD 6,951 ft. D3 oil well.

White Rose-Plymouth 1-4 North Stewart Lake LSD 1, 4-33-26w4. TD 7,404 ft. D3 oil well.

Texaco C&E A1-25 High River, LSD 1, 25-18-30w4. TD 10,031 ft. D1 oil well.

Cities Service 16-20 Alsike, LSD 16, 20-49-4w5. TD 4,964 ft. Cardium oil well.

SASKATCHEWAN

Delhi-Husky Phillips 1 Garden, LSD 4, 25-10-20w3. TD 4,535 ft. Shaunavon oil well.

White Rose-Souris-Canadian Superior 3-5 Lighting Creek, LSD 3, 35-8-32w1. TD 3,660 ft. Mission Canyon oil well.

MICHIGAN

Roscomm County: Sun Oil Co. 4 Hogan Trustee, SE SE SW 8-22n-4w. IPF 10 BOD from Richfield oil pays, 4,932-34, 4,996-5,000, 5,012-14, 5,047-49 ft. TD 5,165 ft. (New pool.)

CALIFORNIA

San Benito County: Franco Western Ashurst 52-A33, NW NE 33-16s-11e, 45 BOPD, 35° gravity, 1 per cent cut, perfs. 3,313-38 ft. TD 4,799 ft. plugged back to 3,900

2
GREAT NAMES ARE JOINED!

SEE PAGES 266, 267

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ft. (New field discovery near Vallecitos field.)

WEST VIRGINIA

Randolph County, Dry Fork district: Columbian Carbon Co. 1238 U.S.A., elevation 3,083 ft., 582,000 cu. ft. gas, chert 5,045-5,174 ft., Oriskany sand 5,210 ft., gas 5,236 and 5,396 ft. TD 5,400 ft.

TEXAS GULF COAST

Jackson County: K & H Operation Co. 1 La-Bauve Estate et al, Joseph H. Bell Sur., A-7. IP 181.57 BOPD, ¼-in., 37.8°, perforations 8,334-46 ft. TD 8,477 ft. (New field—Possum Ridge, La Bauve sand).

EAST TEXAS

Anderson County: L. Holotik, Trustee 1 Fred Huddleston, W. R. Wilson Sur., A-66, 2 mi. W Slocum. IP 72.8 BOPD, 11/64-in., TP 340 psi., GOR 680, 44°, Woodbine perforations 5,403-07 ft. TD 5,607 ft., elev. 451 ft.

Shelby County: J. C. Mayfield 2 Pickering Lumber Co., H. Petite Sur., A-374, 2½ miles SE Joaquin, new pay in Joaquin field. IP 24,500 M.c.f. gas, plus 20 bbl. 64° condensate per 1,000 M.c.f., RP 1795 psi., perforated upper Glen Rose 3,630-33 ft. TD 3,908 ft., elev. 202 ft.

WEST TEXAS

Andrews County: Stanolind Oil & Gas Co. 1 Fasken Unit, 13-42-T2N-G&MMB&A, Pennsylvanian pay opener in Fasken-Wolfcamp field. IP 283 BOPD, 12/64-in., CP 700 psi., 43°, GOR 325, top Pennsylvanian pay 8,776 ft. IP 179 BOPD, 12/24-in., TP 725 psi., GOR 950, 39?, Wolfcamp 8,620 ft. TD 9,199 ft.

Ector County: TXL Corp. 1-J Ector, 19-45-T1N-T&P, 7 mi. N Notrees. IP 69 BOPD, 20/64-in., TP 300 psi., GOR 2900, 37°, San Andres pay 4,266 ft. TD 6,141 ft.

King County: Fain & McGaha 1 Ross, J. C. Tackitt Sur. 1, 12 mi. NW Knox City, new pay opener in Bussard Peak area. IP 68 BOPD, 36°, GOR 510, Tannehill sand, open hole, 2,663-71 ft. TD 2,671 ft.

Pecos County: Republic Natural Gas Co. 1 Duvall, 1-3-H&TC, 5 mi. SE Imperial. IP 563 BOPD, 28/64-in., TP 700 psi., GOR 863, 43°, McKee perforations 5,490-5,530 ft. TD 6,423 ft., elev. 2,397 ft.

Runnels County: Humble Oil & Refining Co. and G. W. Strake 1 Harber, Sec. 170, ELRR Sur., 5 mi. W Hatchell. IP 5,000 M.c.f. gas, Gray sand 4,470-74 ft., no pressures reported. TD 4,925 ft.

Scurry County: Smith & Breyer 1 Fuller, 606-97-H&TC, 15 mi. NW Snyder. IP 64 BOPD, 24/64-in., TP 180 psi., GOR 400, 38°, San Andres 1,974-2,022 ft. TD 2,135 ft.

Terry County: Anderson-Prichard Oil Corp. 1 Waters, 118-D11-C&M Sur., 9 mi. SW Gomez, designated 2-mi. NW extension to Coroco, SE field. IP 266 BOPD, 11/64-in., TP 120 psi., GOR 333, 36°, Siluro-Devonian perforations 12,751-63 ft. TD 12,800 ft., elev. 3,430 ft.

Tom Green County: Tucker Drilling Co. 1 Kent, Sec. 197, SPRR Sur., Dist. 11, 6 mi. SW Van Court. IP 9,000 M.c.f. gas, Strawn (?) pay 4,632-42 ft. TD 5,325 ft.

NORTH TEXAS

Grayson County: Nortex Oil & Gas Corp. 1 Collums, Gideon Rose Sur., A-993, 2½ mi. SW Sandusky. IPP 140 BOPD, 28°, GOR 250, sand pay 6,529-33 ft. TD 7,428 ft.

Knox County: Christie-Stewart Drilling Co. 1 McAfee, D. G. Burnett Sur. 9, 2½ mi. SE Knox City field. IP 101 BOPD, ¾-in., CP 350 psi., GOR 600, Lower Tannehill 2,084 ft. TD 2,088 ft.

WEST CENTRAL TEXAS

Eastland County: Harding Brothers 1 Davis, Sec. 1, T&NO Sur., 6 mi. NW Ranger. IPP 79 BOPD, 45°, GOR 227, sand pay 1,946 ft. TD 2,001 ft.

Fisher County: D. M. Cogdell 1 Bowden-Etgen, 193-3-H&TC, 7 mi. SW Roby. IP 137 BOPD, 16/64-in., TP 175 psi., GOR 1354, 42°, perforated Canyon sand 4,859-65 ft. TD 4,971 ft.

Miami Operating Co., Inc., 1 Goolsby, Subd. 15, Lge. 314, Bastrop CSL, 1 mi. NW Roby. IP 25 BOPD, ½-in., TP 240 psi., GOR 1950, 45°, Cisco sand 3,882-86 ft. TD 3,888 ft.

Jones County: W. L. Sibley 1 Compton, Sec. 6, OAL Sur., 5 mi. W Lueders. IPP 72 BOPD, 36°, GOR zero, Flippen lime 1,944 ft. TD 1,952 ft.

Jones County: Great Lakes Carbon Corp. 1 Herron, Subd. 3, E. Miles Sur., 219, 13 mi. SW Anson, Canyon sand, IP 240 BOPD, ¼-in., CP 220 psi., GOR 873, 40°, perforations 4,025-41 ft.; IP 155 BOPD, 32/64-in., TP 100 psi., GOR 995, 42°, perforated 4,078-84 ft. TD 5,100 ft.

Stephens County: D. G. Gordon et al 1 Carey, 21-6-T&P, 18 mi. SE Breckenridge. IPP 168 BOPD, 42.6°, GOR 400, lower Strawn sand 2,940-50 ft. TD 2,984 ft.

Throckmorton County: Payne-Johnston 1 Steadham, Sec. 248, BBB&C Sur., 3 mi. SW Throckmorton. IP 322 BOPD, 24/64-in., TP 160 psi., GOR 478, 41°, upper Caddo perforations 4,510-18 ft.; IP 353 BOPD, 18/64-in., TP 455 psi., GOR 734, 41°, lower Caddo perforations 4,804-15 ft. TD 5,109 ft., elev. 1,449 ft.

THE OIL AND GAS JOURNAL

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McClanahan takes over as . . .

. . . Head of West's Largest Firm

ELLIS J. McCLANAHAN, first chairman and president of the new Standard Oil Co. of California, Western Operations, Inc., is an oil man whose widespread and intensive activities have defied the limitations of the 24-hour day.

On January 1 he will take charge of California Standard's wholly integrated western subsidiary—largest oil company in the West. The newly formed firm will handle Socal operations in seven states, Alaska, and Hawaii *(The Oil and Gas Journal, December 17, page 91)*.

A man of apparently boundless energy, he is likely to start his work-day with an early-morning vanguard of the company's clerical staff and outstay the last of the executives who customarily work well past normal office hours.

In between, "Mr. Mac"—as he is known to hundreds at Standard-Western—crams a succession of conferences, local and long-distance phone calls, dictation, and business decisions.

Where does his stamina come from?

"I like this business," McClanahan says. "I think when you like your work, it's hard to decide where the work leaves off and the fun begins."

With all his enthusiasm for the oil industry, however, McClanahan is no one-sided business machine. Personable and ready with a friendly greeting and witty story, he is first of all a warm, human being with a highly developed sense of responsibility to his family and friends, employes, and to the community where he lives.

Despite his heavy schedule of business affairs, he has still found time to be a city councilman in Hillsborough, Calif., head up the local Boy Scout organization, handle the chairmanship of a Community Chest drive, and work in dozens of other charitable and civic activities.

Marketing career . . . Born in Tacoma, Wash., in 1894, McClanahan began his career at the age of 17 as a timekeeper and office worker in the construction of the Pacific Great Eastern Railway in British Columbia.

Employed by California Standard in 1912, he spent several seasons cruising the coast and inland waters of Alaska as a sales representative on a company tanker. He remains today an old Alaska hand, a booster for the area with scores of friends in the territory.

In subsequent years he held down sales assignments throughout the West Coast and served for an extended period as district sales manager in Hawaii, another territory where he is well remembered and admired. In characteristic McClanahan fashion, he returns the admiration wholeheartedly.

Moving steadily closer to the company's top management levels, McClanahan later served as manager of advertising and sales development, president of the subsidiary, Standard Stations, Inc., and general manager of marketing.

He was elected vice president in charge of marketing in 1943, elected to the corporation's board of directors in 1950, and named to his present assignment when the board announced formation of Standard-Western early in December.

Before the new subsidiary was organized, Socal's daily average production for the western division in 1955 was 117,000 bbl. Refining capacity is 300,000 bbl., and sales totaled nearly $726,000,000 last year.

Real service sells . . . McClanahan has for years been active in the American Petroleum Institute's Division of Marketing.

Recently, as chairman of the division's personnel training committee, he was instrumental in the development of manuals and training programs to improve and streamline marketing operations at the dealer level.

An able speaker, McClanahan regularly addresses industry and civic groups. His philosophy of marketing is pretty well summed up in the statement he made some years ago to the Congress of Petroleum Retailers:

"Have your customers' best interest at heart. Show them your sincere interest and you'll ring the cash register. Real service always sells . . . over the long run it's the only sure way to maintain and build your volume."

Russell G. Dressler has resigned as manager of chemical-engineering research at Southwest Research Institute, San Antonio, Tex., to open offices as a chemical-process consultant there.

Edward A. Krieg, Jr., formerly chief geologist for Southern Production Co. in Fort Worth, has opened consulting offices in New Orleans. Krieg was with Sidney Schafer & Co. in Houston before joining Southern Production in 1952.

Robert L. Grogan, manager of the supply and distribution department for Clark Oil & Refining Corp., has been appointed vice president in charge of supply and distribution. Grogan has been with Clark since 1949.

Personals

J. J. HOHLER

J. J. Hohler, geologist in New Orleans for Shell Oil Co., has been appointed division exploration manager of the company's new marine exploration division with headquarters in Houston. Hohler joined Shell in 1951. **P. L. Terrasson,** geophysicist in charge of marine geophysical information for the company, has been named division geophysicist for the new division. He has been with Shell since 1948.

Eugene E. Kincaid, reservoir engineer for the Murphy Corp., El Dorado, Ark., has been promoted to division engineer there. Kincaid was with Carter Oil Co. before joining Murphy in 1955.

William B. Barry has been appointed chief petroleum engineer with H. Zinder & Associates, Inc. He will be located in Houston. Barry was formerly with Phillips Petroleum Co.

B. L. Ryan, executive assistant to the vice president of Shell Oil Co. in Houston, has retired. Ryan has been with Shell since 1920. He was manager of Shell's Midland, Tex., exploration and production area and land manager for the company before becoming executive assistant to the vice president in 1954.

Dan E. Boone, geologist for George S. Hammonds, has been elected president of the Dallas Geological Society, succeeding **Holland McCarver,** Seaboard Oil Co. Other new officers for 1957 are: **Norman C. Smith,** consultant, and **Frank Reedy, Jr.,** Republic Natural Gas Co., vice presidents; **Peter N. Wiggins III,** independent, secretary; and **Earl S. Westmoreland,** consultant, treasurer.

R. B. Ross, chief geophysicist for British American Oil Co., Ltd., has been appointed zone exploration manager of the company's new Calgary exploration office. **W. H. Dow,** zone geologist; and **M. Kasian,** zone landman, will also have headquarters in Calgary. **R. N. Taylor** has been named area exploration manager at the company's new Edmonton exploration office. **G. D. Childs,** area geologist, and **J. A. Lawrence,** area landman, will also be located in Edmonton. **R. H. Carlyle** has been appointed chief geophysicist for the company in Calgary.

A. R. Winning has been appointed materials coordinator in Los Angeles for Southern Pacific Pipe Lines, Inc. **B. G. Fannin** has been named chief operator-deliveryman for the company in Tucson, Ariz., and **S. L. Herndon** has been named chief operator-deliveryman in Phoenix, Ariz.

William F. Kenney, vice president and general counsel of Shell Oil Co., has been elected 1957 chairman of American Petroleum Industries Committee. He succeeds **Robert H. Scholl,** vice president and director of Esso Standard Oil Co. Kenney was formerly A.P.I.C. vice chairman. **Henry L. O'Brien,** general counsel and director of Cities Service Co., succeeds Kenney in this position.

William P. Gordon, district superintendent of Britamoil Pipe Line Co., Ltd., Stettler, Alta., district, has been named chief dispatcher and transferred to Edmonton. **Peter Fehr,** construction inspector for Britamoil Pipe Line, will replace Gordon at Stettler. **G. A. Gordon,** district foreman for B-A Alberta Pipe Line, Ltd., an affiliate of Britamoil, has been named district superintendent of that company at Redwater, Alta. He succeeds **Kenneth W. Lloyd.**

J. C. McCarthy, Stanolind Oil & Gas Co., has been elected 1957 chairman of the Wyoming section of the American Institute of Mining, Metallurgical and Petroleum Engineers. Other officers are **Thomas S. Bernatis,** first vice chairman, Intermountain Chemical Co.; **John A. Fraher,** second vice chairman, U. S. Geological Survey; **J. Spence Winn,** secretary-treasurer, Trigood Oil Co.; and **Sylvester J. Fisher,** assistant secretary-treasurer, Mountain Fuel Co.

S. F. BOWLBY

Samuel F. Bowlby, vice president and senior West Coast representative for Shell Oil Co., has been elected president of the Western Oil and Gas Association. He succeeds **John W. Hancock,** president of Hancock Oil Co. Other officers of the association are **Olen Lane,** first vice president, vice president, Continental Oil Co.; **D. T. Staples,** second vice president, president Tidewater Oil Co.; **T. H. Wallace,** treasurer, vice president, Western Gulf Oil Co.; and **Felix Chappellet,** association vice president and general manager. **Eobert O. Anderson,** president of Wilshire Oil Co., has been elected a director.

William E. Ferguson, vice president and production manager for Ohio Fuel Gas Co., and **Frank S. Williams,** vice president in charge of distribution, have been elected directors of the company.

J. E. McCollum has joined Sinclair Oil & Gas Co. in Houston as assistant division superintendent, gas and gas products. He was formerly with Southern Production Co. in West Columbia, Tex.

Henry E. Winter, regional executive for South American producing in the producing coordination department of Standard Oil Co. (N. J.), has transferred to International Petroleum Co., Ltd., in Coral Gables, Fla., as Venezuelan coordinator. International is a Jersey Standard subsidiary.

GEARHART

Donald R. Gearhart has been elected president of Sinclair Canada Oil Co., subsidiary of Sinclair Oil & Gas Co. Gearhart has been a vice president and general manager of Sinclair Canada. **Kenneth W. Germond,** formerly with Southern Production Co., has been appointed manager of exploration for Sinclair Canada. Southern Production was acquired by Sinclair Canada 2 months ago. **D. A. Jerome,** district land man for Sinclair Canada since 1953, has been named a vice president of the company. **George F. Chadburn,** formerly division land man for Southern Production, has been appointed manager of Sinclair Canada's land department.

William Wiseman, process department head at Esso Standard Oil Co.'s Bayway refinery, Linden, N. J., has been appointed assistant general manager of the Antwerp, Belgium, refinery of Esso Standard (Belgium) S.A. The Bayway refinery's process department has been divided into two divisions, chemical products and petroleum products. **Douglas Bates,** formerly employe relations manager, will head the chemical products division and **Randy Wilkinson,** head of the technical department, has been appointed head of the petroleum products division. **Cape Harney,** chemical products division head, replaces Bates in employe relations, and **John Cogan,** head of the technical department at the company's Bayonne, N. J., refinery, will replace Wilkinson in that capacity at Bayway. **Russ Ernest** will succeed Cogan as technical department head at Bayonne.

Personals

Donald Foster, geologist for Continental Oil Co. in Billings, Mont., has been transferred to Casper, Wyo.

Arron M. Allen has been promoted from assistant marine production foreman to foreman in the Louisiana-Gulf production district of Magnolia Petroleum Co.

John O. Davis, district production superintendent of Monterey Oil Co., has been transferred to Midland, Tex., from Victoria, Tex.

William Vance, production engineer for Continental Oil Co., has been named senior production engineer and transferred to Lake Charles, La., from Ozona, Tex.

Charles R. Rider, chairman of the board and chief executive officer of Drilling & Exploration Co., Inc., Los Angeles drilling contractor, has been elected president of the company. He succeeds **C. A. Wiggins,** who has resigned. Wiggins will remain as consultant to the company for 3 years.

HETHERINGTON

Charles R. Hetherington, vice president of Pacific Petroleums, Ltd., has been named president and director of its recently acquired subsidiary, X-L Refineries, Ltd., Dawson Creek, B. C. Other officers of X-L are **George L. McMahon,** vice president and director; **A. P. Bowsher,** treasurer and director; **L. M. Youell,** secretary and director; and **W. N. Graburn** and **R. G. McCulloch,** directors.

William W. Clawson, president of Mobil Producing Co. and Mobil Oil of Canada, Ltd., Billings, Mont., has been appointed coordinator of domestic production and a member of the producing committee of Socony Mobil Oil Co. **Edward C. Cram,** presently coordinator of domestic production for the company, will take over from Clawson as president of the two exploration and production affiliates in Billings. Clawson joined Magnolia Petroleum Co. in 1933 as a geologist and served as chief geologist at Dallas from 1946 to 1952. He was promoted to his present post with the Socony Mobil organization in 1952. Cram joined Socony Mobil in 1936. He also worked 10 years with Magnolia—the last 5 of them as coordinator of exploitation. He was named assistant coordinator of domestic production for Socony in 1951 and coordinator in 1953.

Stanley B. Radack, formerly district geologist with Buffalo Oil Co., has joined Sinclair Oil & Gas Co. as geologist in Santa Barbara, Venezuela.

F. H. RAMSEUR

Fred H. Ramseur, Jr., manager of the natural-gasoline division of Arkansas Fuel Oil Corp. in Shreveport, La., has been named coordinator of light-ends and natural-gasoline plants for Cities Service Co. in New York. Ramseur is a chemical engineering graduate of North Carolina State University. Ramseur will be succeeded by **M. F. Wirges,** formerly assistant to the manager, gasoline-chemical division. Wirges has been with Cities Service since 1946. **W. G. Osborne,** division chief clerk in Shreveport, La., has been appointed assistant to the manager. **W. H. Heyland,** formerly operations assistant in Shreveport, has been named superintendent of operations.

J. G. Savins, a member of the technical staff of Magnolia Petroleum Co.'s field research laboratory in Dallas, has been promoted to senior research technologist in the drilling fluids and cements group of the production-research division.

Samuel Messer, chairman of the executive committee of Quaker State Oil Refining Corp., has received his 60-year service pin award from the company. Messer was formerly president and chairman of the board of the company. He was a member of the American Petroleum Institute's first board of directors.

Bob Maynard, district geologist for Sunray Mid-Continent Oil Co. in Bakersfield, Calif., has been appointed Pacific Coast regional geologist for the company. **Frank Reynolds,** senior geologist, has been named district geologist in Bakersfield. **Bob Hindle,** geologist in Los Angeles, has been appointed a senior geologist there.

J. C. Hart, Shell Oil Co., has been named 1957 president of the Permian Basin Crude Oil Representatives Association. Other new officers include **John A. Mills,** vice president, The Texas Co.; **J. E. Damewood,** secretary-editor, Stanolind Oil Purchasing Co.; **V. W. Glasgow,** treasurer, Phillips Petroleum Co.; **R. L. Denton,** representative to National Oil Scouts and Landmen's Association, Magnolia Petroleum Co.; and **R. P. Booker,** alternate representative, Cities Service Oil Co.

DEATHS

Russell M. Brown, 54, Bronxville, N. Y., general manager of the refining division of California Texas Co., Ltd., and vice president of Bahrain Petroleum Co., Ltd., died recently in Mason, Mich., after a long illness. Brown had been in the oil industry since 1928. He joined Bahrain Petroleum, one of the Caltex group of companies, in 1937. He remained in Bahrain until 1953 when he became manager of Caltex's refining division.

Fero Williams, 54, Belvedere, Calif., senior vice president, treasurer, and director of Tidewater Oil Co., died December 24 in Manhattan Beach, Calif., while visiting his daughter. Williams joined Tidewater in 1952. He had been associated with Pacific Western Oil Corp., now Getty Oil Co., since 1927.

Alden B. Rowley, 68, Tulsa consulting geologist, died December 21 in Tulsa. Rowley suffered a cerebral hemorrhage while acting as a pallbearer at the funeral of John Whitten Hammond, independent oil man who died December 19.

A. L. Derby, 81, founder and former president and board chairman of Derby Oil Co., died December 24 in Wichita. Derby retired in the 1940's after selling controlling interest in his company to Colorado Oil & Gas Corp. The company is now Derby Refining Co. Derby was one the founders of the Independent Petroleum Association of America.

Nathan P. Isenberger, 60, foreign consultant for Phillips Petroleum Co., died December 21 in Bartlesville, Okla. Isenberger was with Sun Oil Co., Gulf Oil Corp., and Amerada Petroleum Corp. before joining Phillips in 1933.

Sam P. Kraemer, Jr., 64, Orange County, California, head of the Kraemer Oil Estate, died recently in Santa Barbara, Calif. Kraemer entered the oil business around 1918 in the Placentia and Yorba Linda fields.

J. D. Halbert, 49, partner in Sabine Drilling Co. and once associated with H. L. Hunt, Dallas, died December 17 in Midland, Tex.

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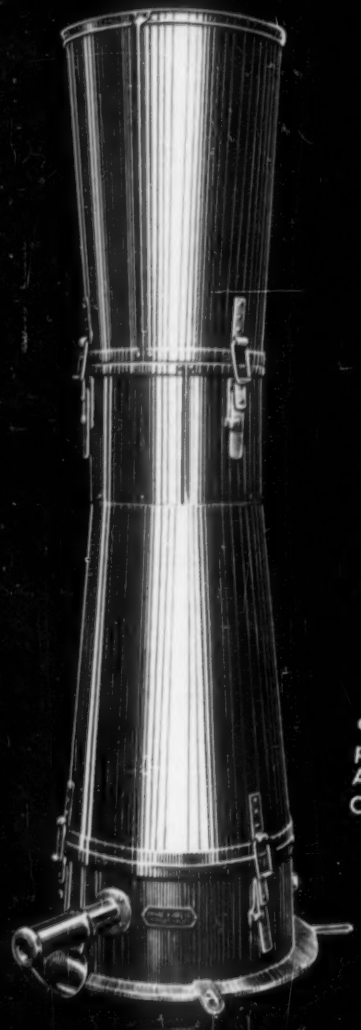

To meet the persistent demand for an EDUCTOR which would be applicable to the smaller bulk storage and lease tanks, marketing terminal and small refinery tanks and towers which need ventilating, we are now offering a 12" EDUCTOR designed to fit tank roof openings of 10 to 16 inches without modification. It will also fit smaller or larger ventilating openings by simple field adaption.

This model, ST-10500,. is specifically designed for those applications where ventilation is mandatory, but where an air compressor of large capacity is not available. This model operates with a small air compressor which may be on hand or easily rented locally. This EDUCTOR is made of heavy gage galvanized iron, and comes complete with three simple, easily interchangeable bronze nozzles for 25, 35, and 50 cfm of prime mover air at 100 psi, as well as a pressure gage, and air strainer.

In a recent field test on 2,000 barrel lease tanks, oil vapor concentration was reduced below the lower flammable limits in from 5 to 30 minutes, depending upon whether conditions were favorable or unfavorable, and operating with prime mover air at only 30 cfm and 100# psi. Other field tests have proven equally spectacular. All tests were conducted in accordance with A.P.I. Tank Cleaning Manuals 1-A and 1-B.

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Latest Figures . . . Industry Trends

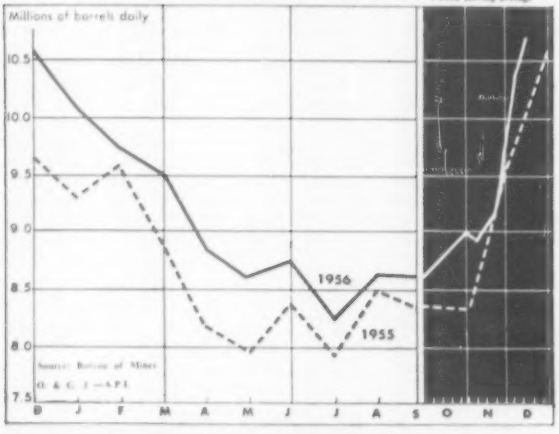
A QUICK LOOK AT THE HIGHLIGHTS

	LATEST WEEK	Change from WEEK AGO		Change from YEAR AGO	
Production	7,293,895	UP	16,071	UP	103,955
Crude stocks	273,707,000	UP	90,000	UP	15,648,000
Completions	1,071	DOWN	170	UP	98
Refinery runs*	8,000,000	UP	135,000	UP	316,000
Gasoline stocks*	177,037,000	UP	1,610,000	UP	16,631,000
Kerosine stocks*	32,418,000	DOWN	693,000	UP	2,509,000
Distillate stocks*	139,610,000	DOWN	5,940,000	UP	13,570,000
Residual stocks*	43,145,000	DOWN	610,000	UP	2,210,000
Four-product stocks*	392,210,000	DOWN	5,633,000	UP	34,920,000
Total imports*	1,226,500	DOWN	457,900	DOWN	66,200

*For week ended December 14.

ALL TABLES AND CHARTS, BASED ON A.P.I. REPORT, ARE FOR WEEK ENDED DECEMBER 14 SINCE THE A.P.I. REPORT FOR DECEMBER 21, WAS DELAYED BECAUSE OF CHRISTMAS HOLIDAYS.

TOTAL DEMAND—ALL OILS



Export Demand for Residual Supports Inland Heavy Fuel Prices and Markets

MOST of the strength reported for heavy fuels on inland-area markets can be credited to the big export demand on the Gulf Coast. Group 3 refiners are reporting very little gain in actual shipments to northern markets, but continuing high demand on the Gulf Coast is taking any surplus material. The result is a firm Group 3 residual market.

The lower-than-expected movement to northern markets can not be charged entirely to the weather. Temperatures were below normal during the first half of December in much of the industrial area near Chicago and at least down to normal for all of the area served by shipments out of the Mid-Continent.

Some suppliers believe that the expansion in demand this winter has been limited by availability of natural gas. Reports indicate that there has been some increase in use of gas under noninterruptible contracts and fewer cutoffs under interruptible agreements.

Most of the high-sulfur material shipped to northern markets is selling for $2.20 a barrel with low-sulfur fuel bringing 10 cents a barrel more. Some Mid-Continent refiners have turned down offers from the Gulf Coast, thinking that regular customers in northern areas would need the fuel before the end of the year. Unless demand increases in the normal market areas, more material will be shipped to the Gulf Coast.

Distillate-fuel prices continued to improve in the Mid-Continent area. Basic quotations were raised at about the same time that under-the-market prices moved up. The end result has been a boost of 0.5 cent a gallon for light heating oils on the Group 3 market. The higher prices are based on increased sales in December.

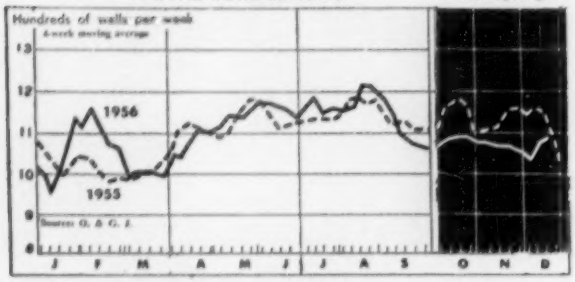
Distillate fuels made a very poor showing in November, compared with the same month in the previous year. There were two important factors in this small gain. First, the comparison was with very high demands in November last year. Total distillate demand in November 1955 was 13.3 per cent above demand for November 1954. In turn, November 1954 was 17.7 per cent above the same month in 1953.

The high level of sales in October was the other important factor influencing market movement in November. Total distillate demand in October represented an increase of 14 per cent over October 1955. Also, the total indicated demand could not be accounted for on a basis of burners and temperatures. This seems to point to a build-up of secondary and consumer stocks. Since some of this stock accumulation had to be worked off in November, sales during that month dropped slightly below the average for November 1955. Demand has been moving up in December.

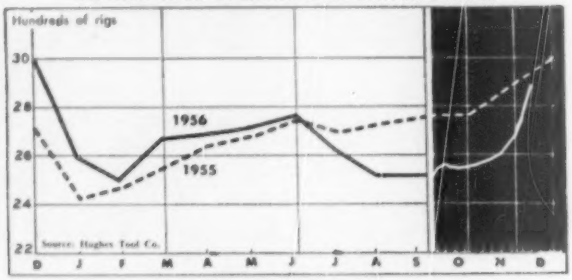
Gasoline spot prices are suffering from pressure selling by individual refiners. The supplier who cuts his price to get a new customer holds that customer only until someone offers a lower price. The volumetric gain this month may be offset next month when he not only loses his new customer but also part of his regular spot business.

Recent trends in distillate prices may offer partial solution to the gasoline-stock problem. If distillate prices move higher and gasoline lower, the smaller spread may promote yield shifts from gasoline to distillate.

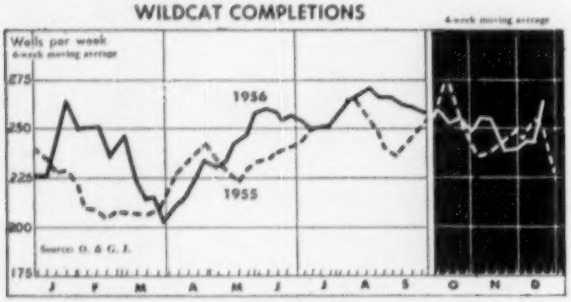
TOTAL COMPLETIONS



ROTARY RIGS OPERATING IN UNITED STATES



WILDCAT COMPLETIONS



ACTIVE ROTARY RIGS*

Area—	12-17-56	12-10-56	12-19-55
North Central and East	136	119	156
Southeast	42	39	30
Okla., Kans., Ark., Mo.	511	489	582
Louisiana	501	484	464
North and East Texas-Panhandle	478	463	476
Gulf and South Texas	290	280	311
West Texas-New Mexico	566	522	658
Rocky Mountain	256	256	312
Pacific Coast	114	114	148
Total United States	2,894	2,766	3,137
Western Canada	238	241	201

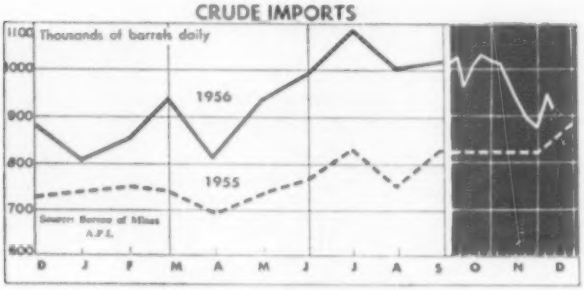
*Hughes Tool Co.

WEEKLY WELL COMPLETIONS . . . WEEK ENDED DECEMBER 22, 1956

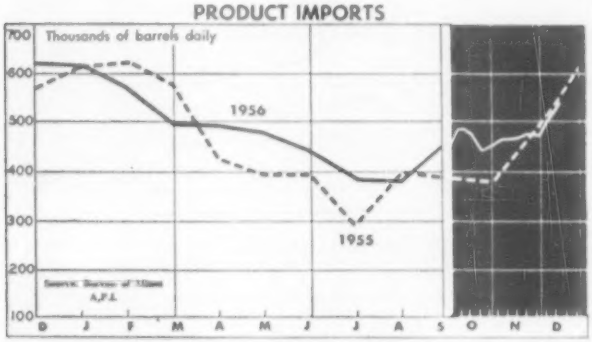
	Total of all wells					Cum.		Wildcat completions and discoveries					Cumulative total, 1956				
	Comp.	Oil	Gas	Dry	Footage	1956	1955	Oil	Dist.	Gas	Dry	Total	Oil	Dist.	Gas	Dry	Total
Ala.-Ga.-Fla.	0	0	0	0	0	107	72	0	0	0	0	0	0	0	1	49	50
Arkansas	26	18	2	6	71,931	970	804	0	0	1	2	3	33	0	8	140	181
California	60	51	0	9	244,251	2,203	2,388	1	0	0	8	9	49	0	9	448	506
Colorado	23	2	3	18	120,261	1,196	1,479	0	0	1	15	16	26	0	20	615	661
Illinois	74	24	5	45	160,168	3,738	3,842	0	0	0	11	11	49	0	5	700	754
Indiana	30	10	0	*20	51,000	719	699	0	0	0	7	7	16	0	1	126	143
Kansas	90	44	11	35	344,117	4,840	4,903	2	0	5	14	21	123	4	46	881	1,054
Kentucky	33	19	2	12	44,904	1,890	1,588	3	0	0	5	8	43	0	0	389	432
Louisiana	89	54	3	32	591,877	3,747	3,994	4	0	0	19	23	117	49	61	532	759
North	44	31	0	13	133,803	1,661	2,071	3	0	0	5	8	35	2	3	219	259
South	36	15	2	19	375,493	1,674	1,923	1	0	0	14	15	64	41	43	275	423
Offshore	9	8	1	0	82,581	412		0	0	0	0	0	18	6	15	38	77
Michigan	13	8	0	5	52,230	434	507	1	0	0	4	5	10	0	2	155	167
Mississippi	5	3	0	2	37,672	427	448	0	0	0	1	1	18	1	1	190	210
Montana	13	4	0	9	44,251	484	399	0	0	0	8	8	11	0	1	177	189
Nebraska	17	4	0	13	102,959	899	884	0	0	0	8	8	38	0	1	404	443
New Mexico	47	17	17	13	200,558	1,887	1,684	2	0	0	6	8	55	1	10	211	277
Northwest	29	5	17	7	103,561	847	608	0	0	0	3	3	14	0	8	84	106
Southeast	18	12	0	6	96,997	1,040	1,076	2	0	0	3	5	41	1	2	127	171
North Dakota	6	3	0	3	44,627	260	251	0	0	0	3	3	8	0	0	70	78
Ohio	33	9	7	†17	61,873	1,073	1,203	0	0	0	0	0	2	0	5	6	13
Oklahoma	121	70	5	‡46	413,393	7,925	8,333	3	2	1	12	18	128	22	39	657	846
Pennsylvania-New York	5	0	5	0	17,140	1,234	1,444	0	0	0	0	0	0	0	15	21	36
Texas	353	177	15	161	1,411,232	21,023	19,968	13	0	1	108	122	723	32	199	4,536	5,490
Southwest (1 & 4)	58	22	6	30	234,812	3,024	3,083	0	0	1	20	21	122	6	67	880	1,075
Gulf Coast (2 & 3)	44	16	5	23	322,749	2,571	2,505	1	0	0	14	15	64	16	78	692	850
East (5 & 6)	21	8	0	13	101,181	1,113	983	0	0	0	11	11	16	3	7	395	421
N. Central (7-B & 9)	140	63	0	77	377,968	7,477	7,448	9	0	0	49	58	326	0	12	1,804	2,142
West (7-C & 8)	67	51	0	16	293,756	5,548	4,910	3	0	0	13	16	175	0	12	692	879
Panhandle (10)	23	17	4	2	80,766	1,290	1,039	0	0	0	1	1	20	7	23	73	123
Utah	0	0	0	0	0	138	82	0	0	0	0	0	1	0	5	69	75
West Virginia	5	1	4	0	19,638	670	635	0	0	1	0	1	0	0	15	12	27
Wyoming	28	9	0	19	112,217	900	881	1	0	0	14	15	18	0	12	249	279
Miscellaneous	0	0	0	0	0	73	59	0	0	0	0	0	4	0	0	61	65
Total U. S.	**1,071**	527	79	465	4,146,299	56,837	56,547	30	2	10	245	**287**	1,472	109	456	10,698	12,735
Total previous week	1,241	637	96	508	4,638,280			23	0	16	206	245	1,442	107	446	10,453	12,448
Total Dec. 24, 1955	973	514	90	369	4,191,238			29	3	8	177	217	1,593	215	343	10,005	12,156
Cumulative 1956	56,837	30,494	4,034	22,309	227,701,675												
Western Canada	53	38	1	14	247,719	3,178											

Service wells included: *2, †1, ‡9.

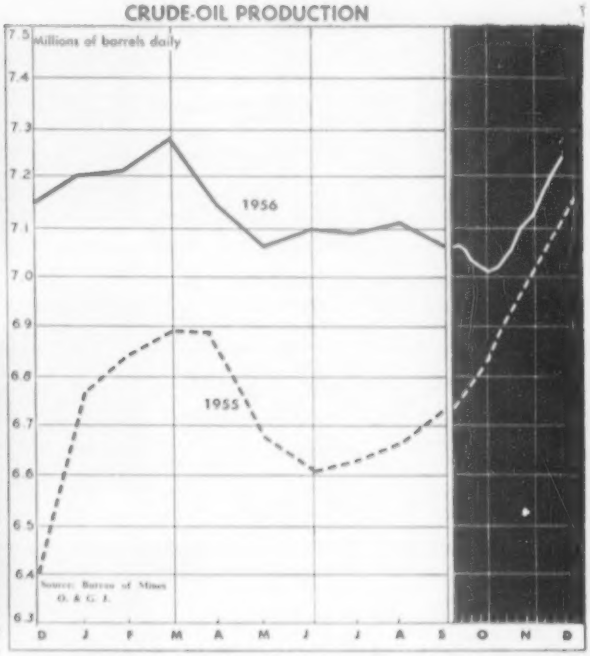
CRUDE IMPORTS



PRODUCT IMPORTS



CRUDE-OIL PRODUCTION



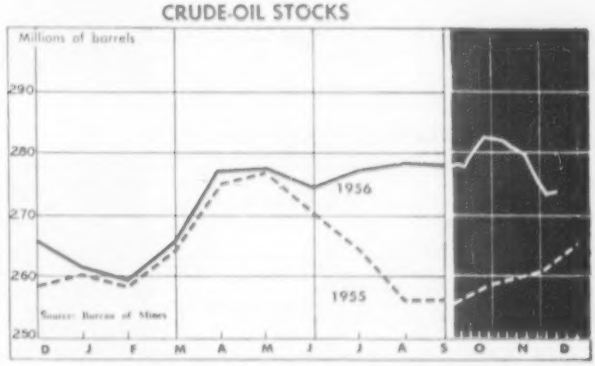
DAILY AVERAGE PRODUCTION FOR WEEK

December 22, 1956

	Crude oil	Lease condensate	Total	Dec. 15 total
Alabama	10,600		10,600	10,500
Arkansas	77,360	240	77,600	78,100
California	952,600		952,600	951,800
Colorado	158,100		158,100	156,900
Eastern	50,000		50,000	49,600
Florida	1,300		1,300	1,300
Illinois	238,000		238,000	242,400
Indiana	32,800		32,800	32,400
Kansas	†341,000		†341,000	†333,100
Kentucky	48,400		48,400	45,500
Louisiana	819,000	78,200	897,200	897,200
North	128,000	3,200	131,200	131,200
South	691,000	75,000	766,000	766,000
Michigan	28,300		28,300	28,100
Mississippi	109,275	5,000	114,275	114,275
Montana	66,200		66,200	66,300
Nebraska	39,800		39,800	37,850
Nevada	150		150	200
New Mexico	242,000	4,350	246,350	246,300
North Dakota	33,500		33,500	34,300
Oklahoma	†606,250		†606,250	†599,850
Texas	3,002,000	55,900	3,057,900	3,057,900
Dist. 1	55,500	575	56,075	56,075
Dist. 2	144,600	8,700	153,300	153,300
Dist. 3	430,500	26,000	456,500	456,500
Dist. 4	230,000	6,800	236,800	236,800
Dist. 5	39,500	550	40,050	40,050
Dist. 6	127,000	6,300	133,300	133,300
East Texas Field	207,900		207,900	207,900
Dist. 7-B	159,000	60	159,060	159,060
Dist. 7-C	166,000	4,500	170,500	170,500
Dist. 8	1,128,000	1,500	1,129,500	1,129,500
Dist. 9	208,000	690	208,690	208,690
Dist. 10	106,000	225	106,225	106,225
Utah	8,470		8,470	8,550
Wyoming	285,000		285,000	285,300
Others	‡100		‡100	‡100
Total U. S.	7,150,205	143,690	**7,293,895**	7,277,825
Change from prev. week, up			**16,070**	
Canada	529,800		529,800	†528,600
Total U. S. production, January 1-December 22				2,549,578,990 bbl.
Same period last year (crude plus cond.)				*2,420,570,860 bbl.

*Includes 40,417,150 bbl. of condensate. †Week ended previous Monday. ‡S. Dakota.

CRUDE-OIL STOCKS

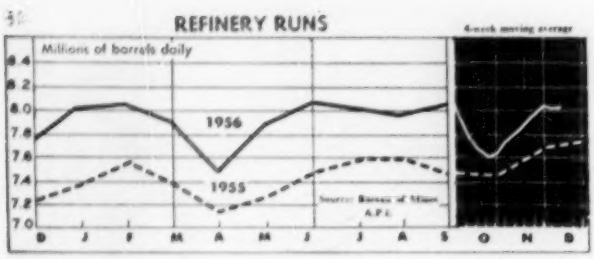


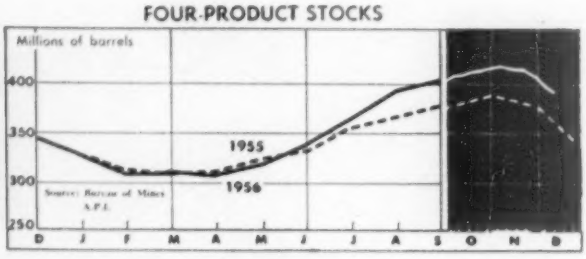
CRUDE-OIL STOCKS BY STATES OF ORIGIN*

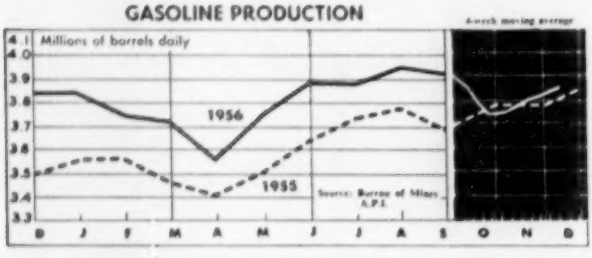
(Thousands of barrels)

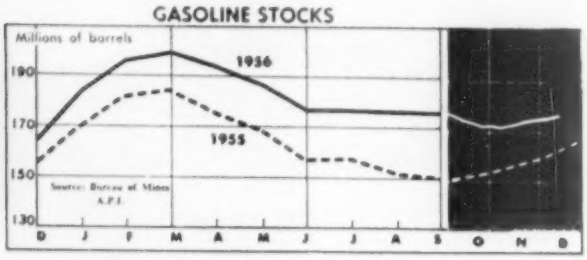
	12-15-56	12-8-56	12-17-55
Pennsylvania Grade	2,418	2,349	3,014
Other Appalachian	2,319	2,266	2,269
Illinois, Indiana, Michigan	11,332	11,750	9,143
Nebraska, North Dakota	2,451	2,293	2,004
Kansas	10,581	10,647	8,013
Oklahoma	23,110	23,441	21,261
Arkansas	2,919	2,905	2,380
Louisiana	19,078	18,771	16,576
North	4,139	2,456	2,440
South	14,939	16,315	14,136
Mississippi	2,780	3,066	2,612
New Mexico	8,402	7,618	7,537
Texas	122,777	122,560	122,484
East Texas proper	8,735	8,800	9,254
West Texas	58,867	58,957	58,152
Texas Gulf	23,739	23,256	23,756
Other Texas	31,436	31,547	31,322
Wyoming	16,303	16,631	15,249
Other Rocky Mountain	7,121	6,322	6,092
California	28,458	28,597	27,393
Foreign	†13,658	14,401	12,032
Total	273,707	273,617	258,059

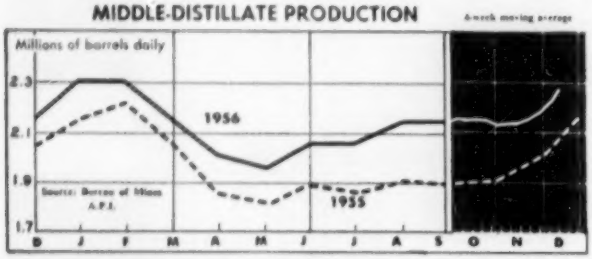
*Bureau of Mines. †Includes 3,948,000 bbl. in California.

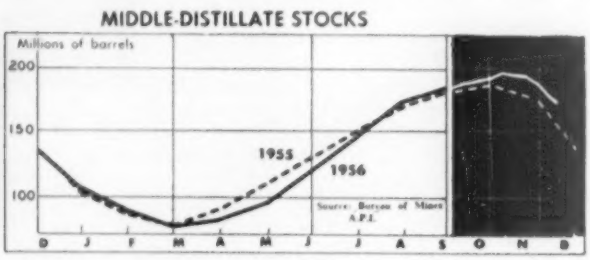


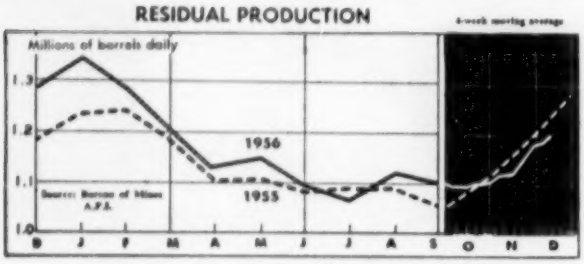


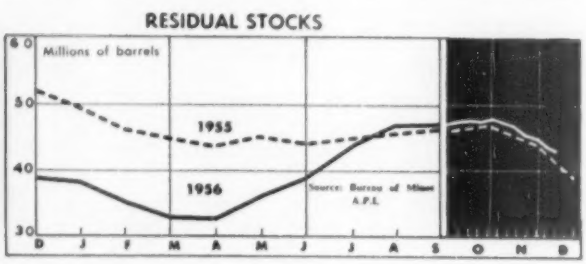

GASOLINE PRODUCTION
Millions of barrels daily
4-week moving average
1956
1955
Source: Bureau of Mines A.P.I.
D J F M A M J J A S O N D




MIDDLE-DISTILLATE PRODUCTION
Millions of barrels daily
4-week moving average
1956
1955
Source: Bureau of Mines A.P.I.
D J F M A M J J A S O N D




RESIDUAL PRODUCTION
Millions of barrels daily
4-week moving average
1956
1955
Source: Bureau of Mines A.P.I.
D J F M A M J J A S O N D



A.P.I. REFINERY REPORT, DECEMBER 14, 1956

(Thousands of barrels)

District—	Daily avg. runs	Daily average production Gaso.*	Kero.	Dist.	Resid.	Stocks‡ Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, December 1955 Daily avg. runs	Daily average production Gaso.*	Kero.	Dist.	Resid.
East Coast	1,191	439.4	48.4	317.6	229.8	39,398	12,717	53,734	11,055	1,102	428.0	27.6	267.4	222.9
Appalachian:														
District 1	104	42.7	5.7	26.7	9.9	4,727	561	3,138	374	112	46.1	5.5	21.1	8.2
District 2	107	54.4	7.9	25.3	15.3	3,082	672	1,086	248	91	50.7	3.8	18.1	12.5
Ind., Ill., Ky.	1,411	755.7	82.1	302.1	217.7	30,158	6,981	21,584	5,592	1,375	751.2	73.3	272.1	192.8
Minn., Wis., Dak.	91	42.6	6.7	22.4	6.0	7,231	1,614	7,900	95	(§)	(§)	(§)	(§)	(§)
Okla., Kans., Mo.	722	405.0	11.0	188.3	40.9	15,049	1,610	12,962	1,447	693	406.2	17.8	162.9	34.9
Inland Texas	268	201.2	14.1	46.6	16.9	7,096	619	1,952	1,782	251	186.8	9.8	47.2	19.0
Texas Gulf Coast	1,879	890.9	105.6	553.5	239.8	26,310	2,972	12,987	6,174	1,940	907.8	137.3	481.2	255.1
La. Gulf Coast	709	362.6	47.6	212.3	47.9	11,367	2,795	6,241	1,603	688	357.8	54.8	165.3	48.1
N. La. and Ark.	105	36.1	9.0	19.3	6.4	4,309	1,114	1,998	280	97	36.7	6.4	24.9	6.7
Rocky Mountain:														
New Mexico	27	15.0	0.6	5.3	4.3	504	10	120	67	22	11.0	0.4	3.9	2.6
Other Rocky Mt.	251	127.6	2.6	60.3	30.7	5,280	429	2,774	911	256	122.8	4.3	62.0	42.3
West Coast	1,135	493.4	4.1	163.4	328.7	22,526	324	13,134	13,517	1,065	482.7	...	153.7	368.6
Dec. 14, 1956	8,000	3,866.6	345.4	1,943.1	1,194.3	177,037	32,418	139,610	43,145	7,692	3,787.8	341.0	1,679.8	1,213.7
Dec. 7, 1956	7,865	3,891.0	412.1	1,885.4	1,194.3	175,427	33,111	145,550	43,755	...	...	...	...	...
Dec. 16, 1955	7,684	3,867.0	346.9	1,725.3	1,231.9	160,406	29,909	126,040	40,935	...	...	...	...	...

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit and in pipelines. §Included in Indiana, Illinois, Kentucky district.

Crude-Oil and Refinery Prices at Representative U. S. and Foreign Points

REFINED-PRODUCT PRICES

Following quotations are for refinery products in cents per gallon moving in interstate shipments on Wednesday each week unless otherwise noted. Crude-oil prices are per barrel at the wells unless otherwise listed.

GASOLINE*

Mid-Continent (Group 3):	
Regular (88 octane)	10.75-11.50
Premium (96 octane)	12.50-13.25
Gulf Coast (cargoes for coastwise or export movements):	
Regular (90 octane)	11.00-11.50
Regular (92 octane)	11.25-11.75
Premium (97 octane)	12.75-13.25
Premium (98 octane)	13.00-13.50
California (rack):	
Regular (84 octane)	12.6-13.1
Premium (93 octane)	13.6-14.1
Premium (96 octane)	14.6-15.1
Caribbean area (cargoes):	
Regular (87 octane)	10.00
Premium (93 octane)	11.50

*Quotations are for octanes shown. Prices usually vary with octane ratings within the regular, premium, and aviation grades.

NATURAL GASOLINE*

Group 3:	
Grade 26-70	4.5
Breckenridge:	
Grade 26-70	4.0

*If 26-70 natural is considered as 100 per cent, prices for lower-vapor-pressure grades increase 2.5 per cent for each unit drop in Reid vapor pressure down to and including 16-lb. Prices for grades below 16-lb. may vary slightly by areas or plants.

KEROSINE AND DISTILLATE

Mid-Continent (Group 3):	
★ Kerosine 42-44	10.25-10.50
★ Diesel oil (58 d.i. and above)	9.875-10.125
★ Distillate No. 1	9.875-10.125
★ Distillate No. 2	9.25-9.50
Gulf Coast (cargoes):	
Kerosine 41-43	9.75-10.25
Distillate No. 2	9.25-9.75
New York Harbor (barges):	
Kerosine 41-43	11.25
Distillate No. 2	10.65
Diesel fuel, 48-52 d.i.	10.95
Caribbean area (cargoes):	
Distillate No. 2	9.25

WAX (LB.)

Oklahoma (Group 3):	
132-135 A.m.p. (semi-refined) in tank cars	6.50
New York (export):	
126-130 A.m.p. crude scale (solid in bags or barrels)	7.35

★Denotes change from previous week.

RESIDUAL FUEL (BBL.)

Mid-Continent (Group 3):	
Residual fuel (max. 1% S)	$2.30-2.50
Gulf Coast (cargoes):	
★ Bunker C fuel	$2.40-2.80
New York Harbor (barges):	
Bunker C fuel	$3.05
Caribbean (cargoes):	
Bunker C	$2.40
California (rack):	
Bunker C fuel, Los Angeles	$2.50

LUBRICATING OILS

Mid-Continent (Group 3):	
150-160 bright stock, solvent refined, 0-10 p.p., 95 v.i.	24
200 vis. neutral oil, solvent refined, 0-10 p.p., 95 v.i.	20.75
Pennsylvania Grade:	
145-155 vis. at 210, bright stock, 8 color, 25 p.t.	27
200 vis. neutral (180 at 100°), 25 p.t.	25

CRUDE-OIL PRICES

GRAVITY SCHEDULE

	Signal Hill, Calif.	Mid-Cont.*	Gulf Coast Tex.†	West Tex.‡ N.M.	Wyo. (sour)
14-14.9	$2.42				
15-15.9	2.46				$1.93
16-16.9	2.49				1.97
17-17.9	2.53				2.01
18-18.9	2.57				2.05
19-19.9	2.60				2.09
20-20.9	2.64	$2.50		$2.37	2.13
21-21.9	2.68	2.52		2.39	2.17
22-22.9	2.72	2.54		2.41	2.21
23-23.9	2.76	2.56		2.43	2.25
24-24.9	2.80	2.58	$3.01	2.45	2.28
25-25.9	2.84	2.60	3.03	2.47	2.31
26-26.9	2.88	2.62	3.05	2.49	2.34
27-27.9	2.92	2.64	3.07	2.51	2.37
28-28.9	2.97	2.66	3.09	2.53	2.40
29-29.9	3.02	2.68	3.11	2.55	2.43
30-30.9	3.07	2.70	3.13	2.57	2.46
31-31.9	3.13	2.72		2.59	2.49
32-32.9	3.19	2.74		2.61	2.52
33-33.9	3.25	2.76		2.63	2.55
34-34.9	3.31	2.78		2.65	2.58
35-35.9	3.36	2.80		2.67	2.61
36-36.9	3.40	2.82		2.69	2.64
37-37.9	3.43	2.84		2.71	2.66
38-38.9		2.86		2.73	2.68
39-39.9		2.88		2.75	2.70
40 and up		2.90		2.77	2.72

*Includes Oklahoma, Kansas, North Dakota, West Texas (sweet), North Central Texas, North Louisiana, Arkansas. †Low-cold Texas, North Louisiana, Arkansas. †Low-cold-test Gulf. ‡Sour.

Effective dates: California, November 19, 1956; east of California, June 15, 1953; Pennsylvania Grade, August 16, 1956.

Some crudes in North Central Texas, West Central Texas, and Texas Panhandle have been shifted to the intermediate schedule with $2.83 for 40° and 2 cents per degree drop. Effective dates range from July 15, 1956, to August 10, 1956.

FLAT PRICES

Louisiana:	
Cotton Valley (distillate)	$3.00
Cotton Valley (Holloway crude)	2.95
Texas:	
East Texas	2.90
Chapel Hill	2.83
Conroe	3.13
Van	2.73
Pennsylvania Grade:	
Bradford	4.68
Middle District	4.50
Southwest Pennsylvania	4.21
West Virginia	4.03
Buckeye Grade	4.07
Zanesville Grade	3.15
Illinois Basin	2.90
Canada:	
Leduc-Woodbend (flat prices D-2, D-3)	2.60
Redwater (Alta.) D-3	2.49
Smiley-Viking (Sask.)	2.26
Pembina	2.52

FOREIGN

Venezuela:	
Cumarebo, 48°-49.9°, Tucupido	3.40
San Joaquin, 41°-41.9°, Puerto La Cruz	3.04
Oficina, 35°-35.9°, Puerto La Cruz	2.80
★ Tia Juana medium, 26.5°-26.9°, Amuay*	2.40
★ Quiriquire, 16.5°-16.9°, Caripito	2.40
★ Lagunillas heavy, flat, Amuay or Las Piedras*	2.33
★ Bachaquero, 16.5°-16.9°, Las Piedras*	2.18

Prices for all crudes of 24° or lighter vary 2 cents per degree change, up or down. All crudes heavier than 24° vary 2.5 cents per half-degree gravity change.

*Also available at La Salina at 3 cents per barrel less.

Middle East, Persian Gulf (cargoes, f.o.b. lifting port):	
Arabian, 36.0°-36.9°, Ras Tanura	$1.97
Iranian, 34.0°-34.9°, Bandar Mashur	1.91
Iranian, 34.0°-34.9°, Abadan	1.86
Iraq, 36.0°-36.9°, Fao	1.87
Kuwait, 31.0°-31.9°, Mina-al-Ahmadi	1.72
Qatar, 39.0°-39.9°, Umm Said	2.06
Middle East, E. Mediterranean:	
Arabian, 36.0°-36.9°, Sidon	2.69
Iraq, 36.0°-36.9°, Tripoli, Banias	2.69
Far East (cargoes, f.o.b. Lutong, Sarawak):	
Seria Light, 37°-38°	2.60

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Gulf-U.S.N.H., dirty (USMC+222.5%)	9.19
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★ P.G.-U.K., dirty (scale+360%) (366s. 1d.)	51.02
N.W.I.-U.K., dirty (scale+325%) (138s. 2d.)	19.25

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Process Techniques for H_2S Extraction-Sulfur Manufacture	1.00
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RANCHES

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SEALED BIDS will be received until 2:00 P. M. CST January 10, 1957, and opened at that time in the Office of the Fort Berthold Indian Agency, New Town, North Dakota, for the leasing of 9600.00 acres of allotted Indian land, located in Township 151 N. Rgs. 94 and 95 W., and Township 152 N. R. 94 W., McKenzie County, North Dakota, for oil and gas mining purposes. The details of the lease offering and how and where to file bids may be obtained by addressing the inquiry to the Superintendent of the Fort Berthold Indian Agency at New Town, North Dakota, or call the Agency Land Office, Phone 74340, New Town.

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T.G.T. Branches Out

Firm buys 208 oil and gas wells, four-state acreage

HOUSTON.—Tennessee Gas Transmission Co. has expanded its interests in oil and gas production through a series of recent purchases totaling about $8,000,000.

The company has acquired 11,729 net producing acres plus undeveloped acreage and an interest in 208 oil and gas wells. The property is scattered through Texas, Louisiana, Oklahoma, and Kansas.

Three transactions were involved. The company bought properties in the Texas Gulf Coast and North Louisiana from Sam E. Wilson, Jr., of Corpus Christi. Kansas properties were acquired from H. C. Bennett and C. L. Roberts of Russell, Kans., and Oklahoma properties were bought from Kirkpatrick Oil Co. of Oklahoma City.

Combined purchases add 2,400 bbl. of oil and 13,000 M.c.f. of natural gas to T.G.T.'s average daily net production. The company's net production of oil, condensate, and plant products previously totaled about 24,200 bbl. daily.

Properties involved . . . The Wilson properties taken over by T.G.T. include interests in 50 producing oil and gas wells on 6,851 net acres of leases in Aransas, Fort Bend, Refugio, and Nueces counties in Texas, and Webster Parish in Louisiana. Also involved in the Wilson deal was a high-pressure gas-gathering system and distillate-recovery system on Mustang Island, Texas.

Properties bought from Kirkpatrick Oil include interests in 80 producing oil and gas wells on 1,224 net acres of leases. They are in Carter, Garvin, and Stephens counties in Oklahoma.

The purchase from Bennett and Roberts involved interests in 78 producing wells on 3,654 net acres in Barton, Ellsworth, Graham, Kingman, McPherson, Rice, and Russell counties in Kansas.

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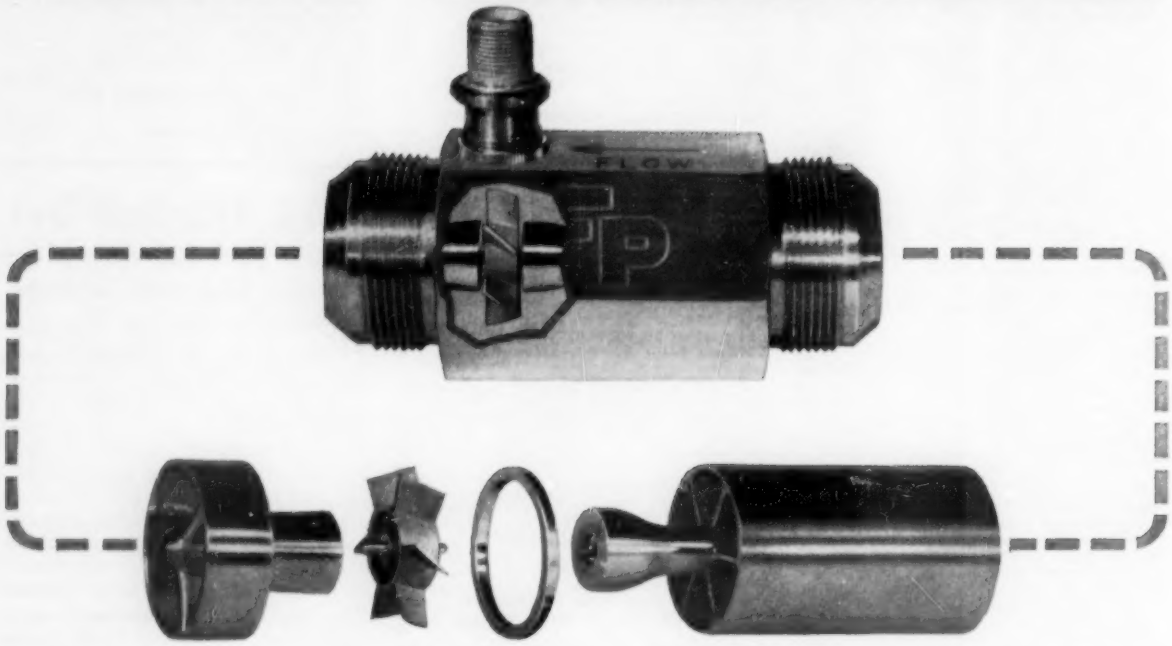

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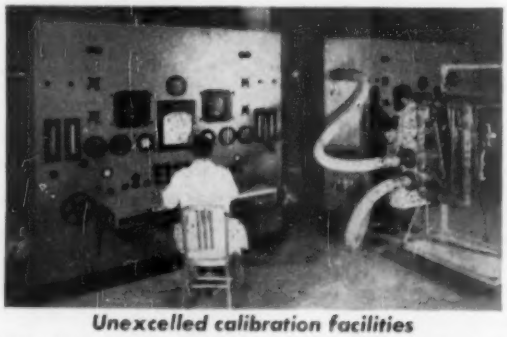

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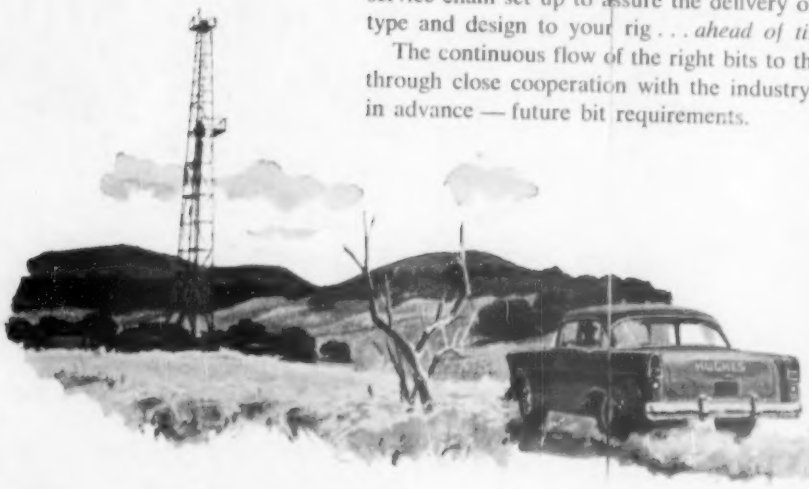
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